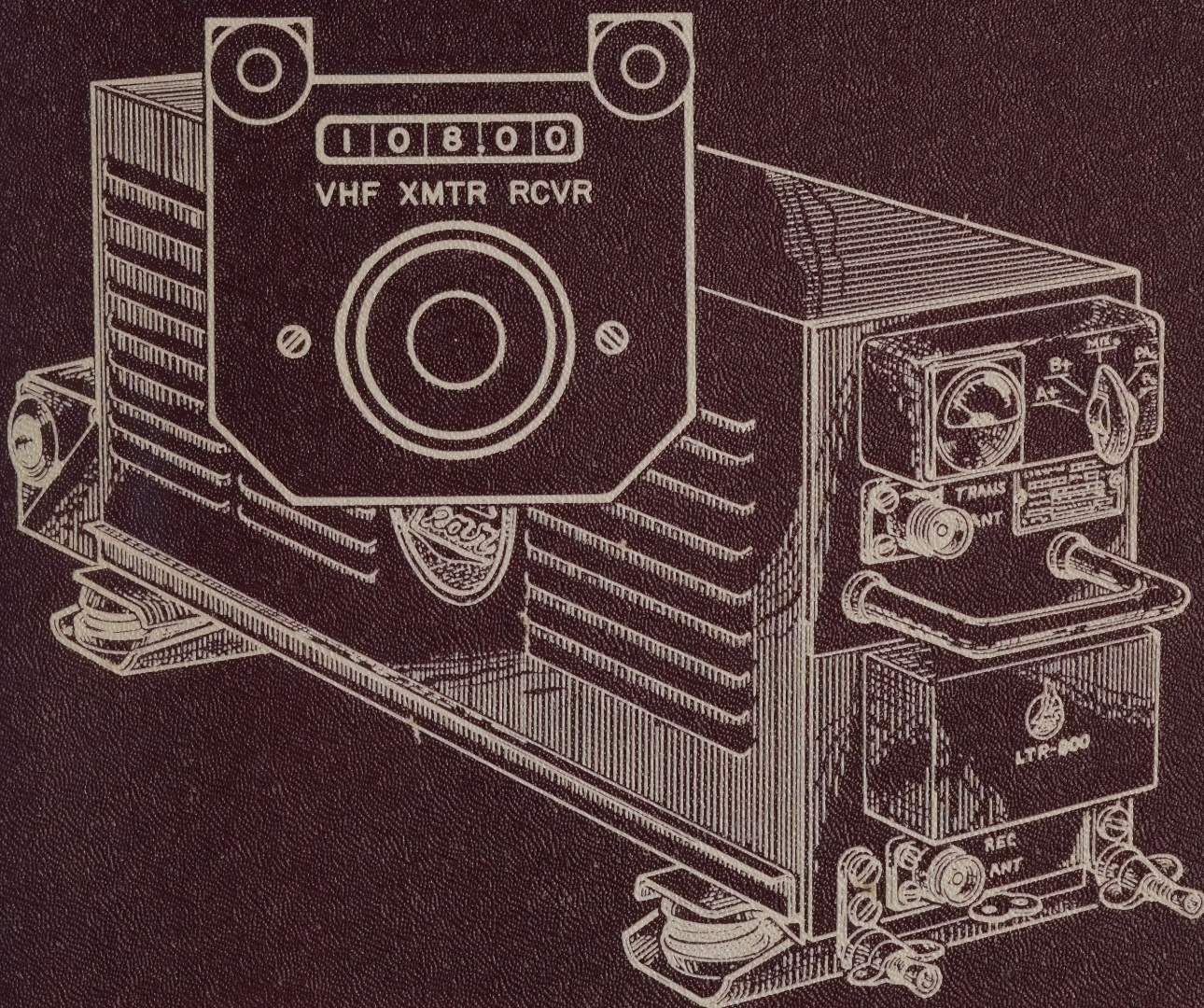


LEAR

LTR-800



**maintenance
manual**

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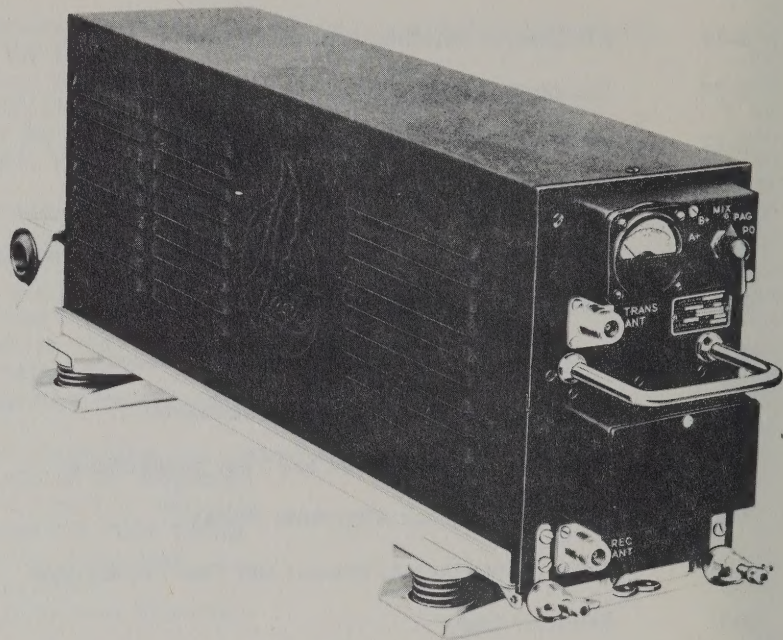
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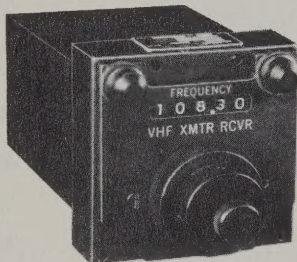
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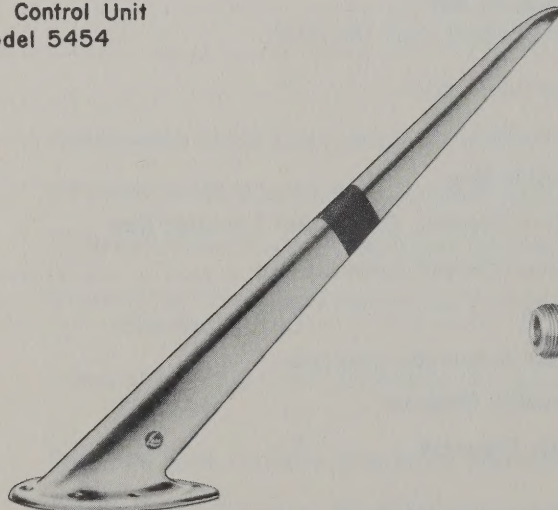
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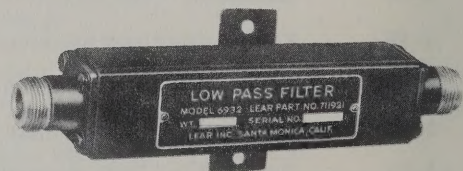
Transmitter-Receiver Unit
Model 5672



Remote Control Unit
Model 5454



VHF Broadband Antenna
Model 2217



Low Pass Filter
Model 6932

Figure 1-1. Components of the Lear Model LTR-800

SECTION I

FUNCTION AND DESCRIPTION

1. PURPOSE OF THE EQUIPMENT

The LTR-800 is a VHF communication transmitter-receiver intended for airborne use. The equipment is crystal controlled and normally provides a maximum of 600 frequency channels, in the frequency range 118-147.95 mc, for the transmitter and 800 channels in the range 108-147.95 mc, for the receiver. Transmitter crystals covering 108-118 mc can also be obtained if desired. The LTR-800 is available with either 50 or 100 kc channel separation and for operation from either 14 or 28 volt primary power supply.

When operating over its maximum frequency range, the LTR-800 transmitter contains 60 crystals and the receiver 61. However, the LTR-800 provides for the installation of only those crystals currently required by the operator. Additional crystals for greater frequency coverage, may be obtained as desired.

The remote control head displays the operating frequency direct in megacycles with a single setting of the selector knobs. For simplex operation, a single control head automatically sets the transmitter and receiver on the same channel. For duplex operation, two control heads are used, one controlling the transmitter, the other controlling the receiver.

The LTR-800 provides receiving facilities for VOR (omnirange), VAR (visual aural range), and the localizer component of ILS. The control head automatically activates the required converter equipment and/or the glideslope receiver channel when any navigational frequency is selected for reception.

2. DESCRIPTION OF COMPONENTS.

There are four basic models of the LTR-800. Two of these are 14 vdc primary power versions with 50 kc or 100 kc channel separation. The other two are 28 vdc primary power versions with 50 kc or 100 kc channel separation. The differences in models and their designation letters are given in paragraph 4b. Physically all versions are practically identical.

Each LTR-800 consists of the transceiver, the control head, the interconnecting cabling, and installation fixtures.

The operating elements of the LTR-800 are described below.

a. Transmitter Unit

The crystal-controlled VHF transmitter, together with the dynamotor power supply, occupies the top half of the shock-mounted transceiver unit. The transmitter consists of two oscillators, frequency multiplier, r-f driver, power amplifier, overload

protection, sidetone detector and modulator circuits. Two rotary solenoids operate the mc and kc crystal-selecting switches. When the unit is not being used as a transmitter, its modulator is available to function as a booster amplifier for the cockpit and cabin speakers. The transmitter is electrically connected to the control head. Mounted on the transmitter front panel are a meter (M101) and selector switch for checking A+, B+, mixer grid current, power amplifier grid current, and power output.

b. Receiver Unit

The VHF crystal-controlled receiver unit occupies the lower half of the package. The receiver incorporates an automatic noise limiter and automatic squelch. The remainder of the circuits are conventional, comprising an r-f amplifier mixer-oscillator, i-f amplifiers, filter, detector-agc, and two audio amplifiers. Two rotary solenoids operate the mc and kc crystal selecting switches. A test box containing adjustable squelch and sidetone controls, a squelch release switch, and audio output jack are mounted on the receiver front panel.

c. Control Head

All controls are accomplished electrically and no flexible shafts or other mechanical linkages are required. The Model 5454 Controller is edge-lighted and gives a horizontal digital presentation (in megacycles) of the transmitting-receiving frequency selected. Three concentric knobs simplify selection -- the largest knob selects the megacycle, and the next smaller knob the decimal fraction. The third knob combines an ON-OFF switch and volume control. The Control Head provides full 800-channel coverage in the range 108-147.95 mc with 50 or 100 kc channel separation.

d. Low Pass Filter

A separate Low Pass Filter, Model 6932A, is supplied with this equipment to be used in series with the transmission line of the LTR-800 Transmitter Unit. The function of the filter is to pass, with virtually no power loss, all frequencies up to 156 mc while offering a high range of attenuation to transmitter harmonics in the frequency range above 156 mc.

e. Connector Kit

A Connector Kit is provided with each LTR-800. The kit contains the connectors, rf cables and hardware necessary to install the equipment in the aircraft.

f. Communications Antenna

The Lear VHF Broadband Communication Antenna Assembly, Model 2217A, is CAA type certificated and is particularly recommended for use with the LTR-800 because of its wide band frequency characteristic. The antenna features an exclusive low-drag shape that resists ice formation. The model is interchangeable with similar type antennas.

3. TECHNICAL CHARACTERISTICS

Type of Operation: VHF Transmitter-Receiver
(Voice)

Frequency Data: 108 through 147.95 mc (50
or 100 kc channel separation
as desired)

Number of Frequencies: 800 (Max) - (See paragraph
4b, below)

Weight:	Transmitter-Receiver	23.1 lbs
	Control Head	1.5 lbs
	Shockmount	3.2 lbs

TOTAL WEIGHT	
(Approx., excluding	
Connector Kit)	27.8 lbs

Over-all Dimensions:
Transmitter-Receiver
(including Shockmount) 24-7/16 lg x 6-3/8 wd x 9-
5/16 h

Control Head - Model	
5454	7-29/64 lg x 3-3/16 wd x 3-3/16 h

Number of Crystals:	
Transmitter	60 (Max)
Receiver	61 (Max)

Operating Power Requirements:
14 vdc at 9 amperes receiving
14 vdc at 18 amperes transmitting
28 vdc at 5 amperes receiving
28 vdc at 9 amperes transmitting

Transmitter Power Output: 5.00 watts min into 50
ohm load

Receiver Sensitivity: 3 uv to produce 100 mw into
500 ohms

Receiver Selectivity: 15 kc min bandwidth at 6
db points
55 kc max bandwidth at
80 db points

Receiver Audio
Power Output: 2 watts

Min Modulation Level: 85%

Modulation Fidelity: Response 300 cps to 3500
cps $\pm$ 8 db

Frequency Accuracy: 0.01%

Transmitter Tube Line-up:

5654 Oscillator (doubler)	5686 Protective Cut-off
6136 Oscillator (No. 1)	6360 Modulator
5686 Doubler	6252 Transmitter Final
6360 r-f Driver	

Receiver Tube Line-up:

5654 r-f amplifier	5749 Third i-f Amplifier
5654 Mixer	6136 Second i-f Amplifier
5654 Local Oscillator	5726 Detector avc
5654 First i-f Amplifier	5726 Automatic Noise Limiter
5750 Second Converter	5670 Squelch and First Audio
5750 Third Converter	5670 Audio Output
	6074 Voltage Regulator

4. REFERENCE DATA

a. Manufacturer's Data

Manufactured by Lear, Incorporated, LearCal
Division, 3171 South Bundy Drive, Santa Monica,
California, U.S.A. Direct all inquiries concern-
ing maintenance parts to the attention of Service
Parts Department at the above address. Direct
all other inquiries to the attention of the Sales De-
partment.

b. Differences in Models

The LTR-800 is available in several different ver-
sions for which the current model numbers are
given below.

Model 5672A: 50 kc separation, 13.75 vdc, 108 - 127.95
mc, 400 channel (Receiver), 118 - 127.95 mc, 200
channel (Transmitter)

Model 5672B: 50 kc separation, 27.5 vdc, 108 - 127.95
mc, 400 channel (Receiver), 118 - 127.95 mc, 200
channel (Transmitter)

Model 5672C: 100 kc separation, 13.75 vdc, 108 -
127.9 mc, 200 channel (Receiver), 118 - 127.9 mc,
100 channel (Transmitter)

Model 5672D: 100 kc separation, 27.5 vdc, 108 - 127.9
mc, 200 channel (Receiver), 118 - 127.9 mc, 100
channel (Transmitter)

Model 5672E: 50 kc separation, 13.75 vdc, 108 - 135.95
mc, 560 channel (Receiver), 118 - 135.95 mc, 360
channel (Transmitter)

Model 5672F: 50 kc separation, 27.5 vdc, 108 - 135.95
mc, 560 channel (Receiver), 118 - 135.95 mc, 360
channel (Transmitter)

Model 5672G: 100 kc separation, 13.75 vdc, 108 - 135.9
mc, 280 channel (Receiver), 118 - 135.9 mc, 180
channel (Transmitter)

Model 5672H: 100 kc separation, 27.5 vdc, 108 - 135.9
mc, 280 channel (Receiver), 118 - 135.9 mc, 180
channel (Transmitter)

Model 5672J: 50 kc separation, 13.75 vdc, 108 - 147.95
mc, 800 channel (Receiver), 118 - 147.95 mc, 600
channel (Transmitter)

Model 5672K: 50 kc separation, 27.5 vdc, 108 - 147.95
mc, 800 channel (Receiver), 118 - 147.95 mc, 600
channel (Transmitter)

Model 5672L: 100 kc separation, 13.75 vdc, 108 - 147.9

mc, 400 channel (Receiver), 118 - 147.9 mc, 300
channel (Transmitter)
Model 5672M: 100 kc separation, 27.5 vdc, 108 - 147.9
mc, 400 channel (Receiver), 118 - 147.9 mc, 300
channel (Transmitter)

c. Equipment Required

(1) Single Installation

The Equipment in Table 1-1 is required for the
completion of a single LTR-800 installation.

TABLE 1-1. LTR-800 EQUIPMENT LIST

Quantity	Item	Model or Part Number
1	*Transmitter-Receiver Assembly - any one of the following basic models:	
	Model 5672A	705615-01
	Transmitter Assembly	705135-01
	Receiver Assembly	705464-01
	Model 5672B	705615-02
	Transmitter Assembly	705135-02
	Receiver Assembly	705464-02
	Model 5672C	705615-03
	Transmitter Assembly	705135-03
	Receiver Assembly	705464-03
	Model 5672D	705615-04
	Transmitter Assembly	705135-04
	Receiver Assembly	705464-04
	Model 5672E	705615-05
	Transmitter Assembly	705135-05
	Receiver Assembly	705464-05
	Model 5672F	705615-06
	Transmitter Assembly	705135-06
	Receiver Assembly	705464-06
	Model 5672G	705615-07
	Transmitter Assembly	705135-07
	Receiver Assembly	705464-07
	Model 5672H	705615-08
	Transmitter Assembly	705135-08
	Receiver Assembly	705464-08
	Model 5672J	705615-09
	Transmitter Assembly	705135-09
	Receiver Assembly	705464-09
	Model 5672K	705615-10
	Transmitter Assembly	705135-10
	Receiver Assembly	705464-10
	Model 5672L	705615-11
	Transmitter Assembly	705135-11
	Receiver Assembly	705464-11
	Model 5672M	705615-12
	Transmitter Assembly	705135-12
	Receiver Assembly	705464-12
1	Control Head - any one of the following models:	
	5454A (50 kc, 13.75 v)	705481-01
	5454B (50 kc, 27.5 v)	705481-02
	5454C (100 kc, 13.75 v)	705481-03
	5454D (100 kc, 27.5 v)	705481-04
1	Antenna, Broadband 2217A	700975
1	Switch and Connector Kit	708877
1	LTR-800 Shockmount	708882
1	VHF Low Pass Filter	711921

*Frequency coverage as given in paragraph 4b, this section.

SECTION II

THEORY OF OPERATION

1. GENERAL

a. Description

The LTR-800 consists of a VHF crystal-controlled transmitter and a separate VHF crystal-controlled superheterodyne receiver. Both units are remote controlled by a single control head through which the operator simultaneously sets both units at the same channel for simplex operation. To start the system, the ON-OFF switch on the control head is rotated clockwise.

b. System Operation

Tuning of the LTR-800 to the frequency selected on the control head is accomplished by a system

of rotary-solenoid and relay actuated switches which place the correct crystals and other tuning elements in the tuned circuits of the equipment. With the exception of the switching and conversion circuits required to obtain the extremely large number of frequency channels covered by the equipment, the LTR-800 operates as a conventional VHF communications transceiver.

Figures 2-1 and 2-2 are block diagrams of the circuit elements used in the LTR-800. To more clearly illustrate the frequency conversion processes which take place in the equipment, a sample frequency is shown being received and transmitted, while the range of frequencies handled by each amplifier is also shown:

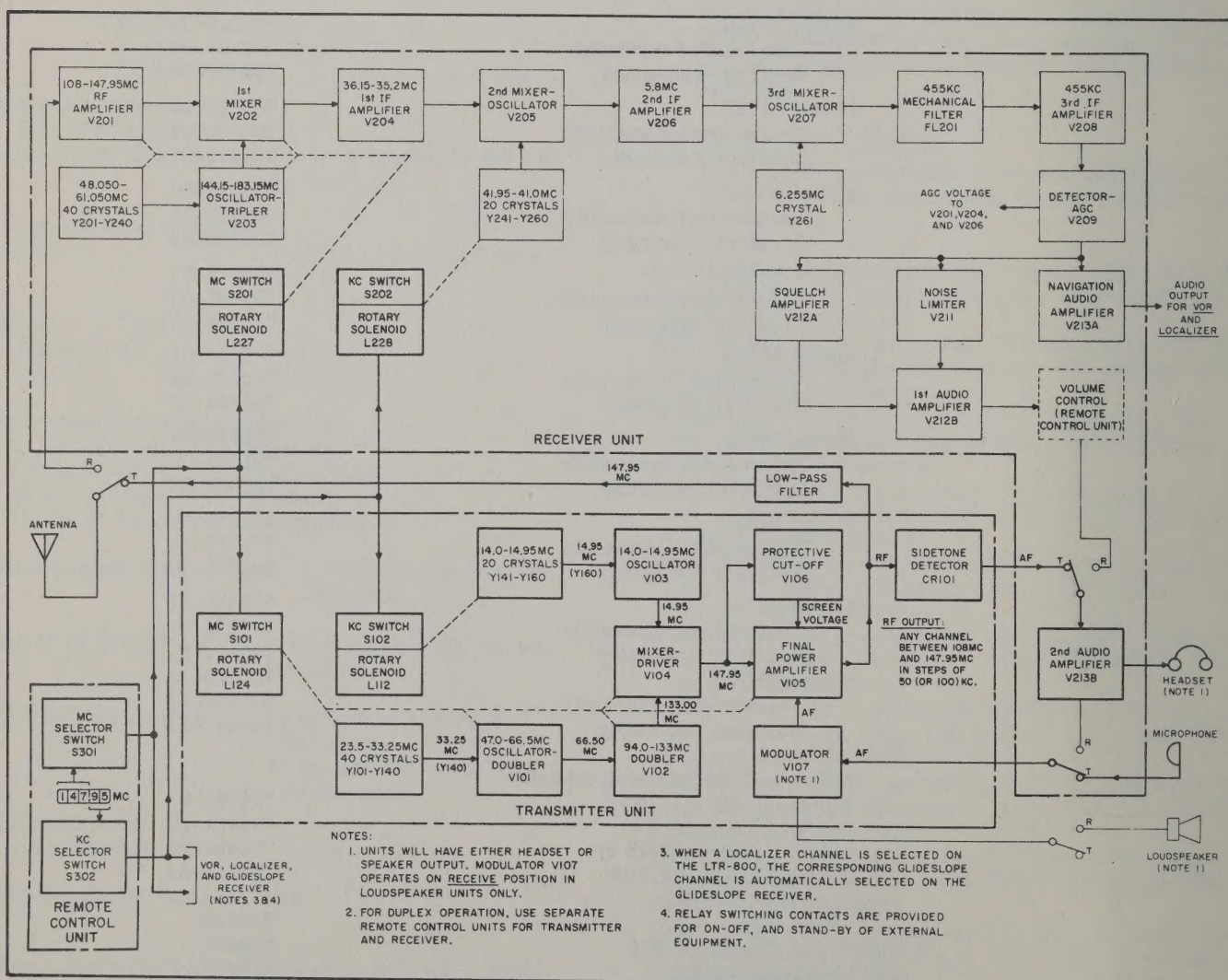


Figure 2-1. LTR-800 Block Diagram, Transmitter Operation

c. Transmitter Unit Operation

Figure 2-1 is a block diagram of the transmitter unit. The sequence of operation is as follows:

Rotation of the large knob (MC selector S301), on the control head, causes rotary solenoid L124 to rotate MC selector switch S101 to the position required for a transmitter output in the range of 147.00 to 147.95 mc. Rotation of the small knob on the control head (KC selector S302) causes rotary solenoid L112 to rotate KC selector switch S102 to the position required for a transmitter output of 950 kc (.95 mc) within the mc range selected by S101.

(1) A 33.25 mc crystal is selected as the basic frequency determinant for the oscillator elements of V101.

(2) An inductance is selected to tune the plate circuit of the Doubler portion of V101 to 66.50 mc.

(3) The output of V101 is delivered to V102. The proper inductance is selected to tune the plate circuit of Doubler V102 to 133.00 mc.

(4) The 133.00 mc output of V102 is delivered to Mixer-Driver V104. V104 is tuned, at both grid and plate, to the intended output frequency range of 147.00 - 147.95 mc. The output from the kc generating stage, V103, must be mixed with the output of Doubler V102 to obtain the final output frequency.

(5) A 14.95 mc frequency is selected as the basic frequency determinant of oscillator V103.

(6) The 14.95 mc output of V103 is mixed, in V104, with the 133.00 mc output of V102.

(7) The resultant, 147.95 mc, is fed to Final Power Amplifier V105. V105 has tuned input and output circuits to attenuate undesired spurious frequencies from the output.

(8) Plate and screen modulation is applied to V105 by Modulator V107.

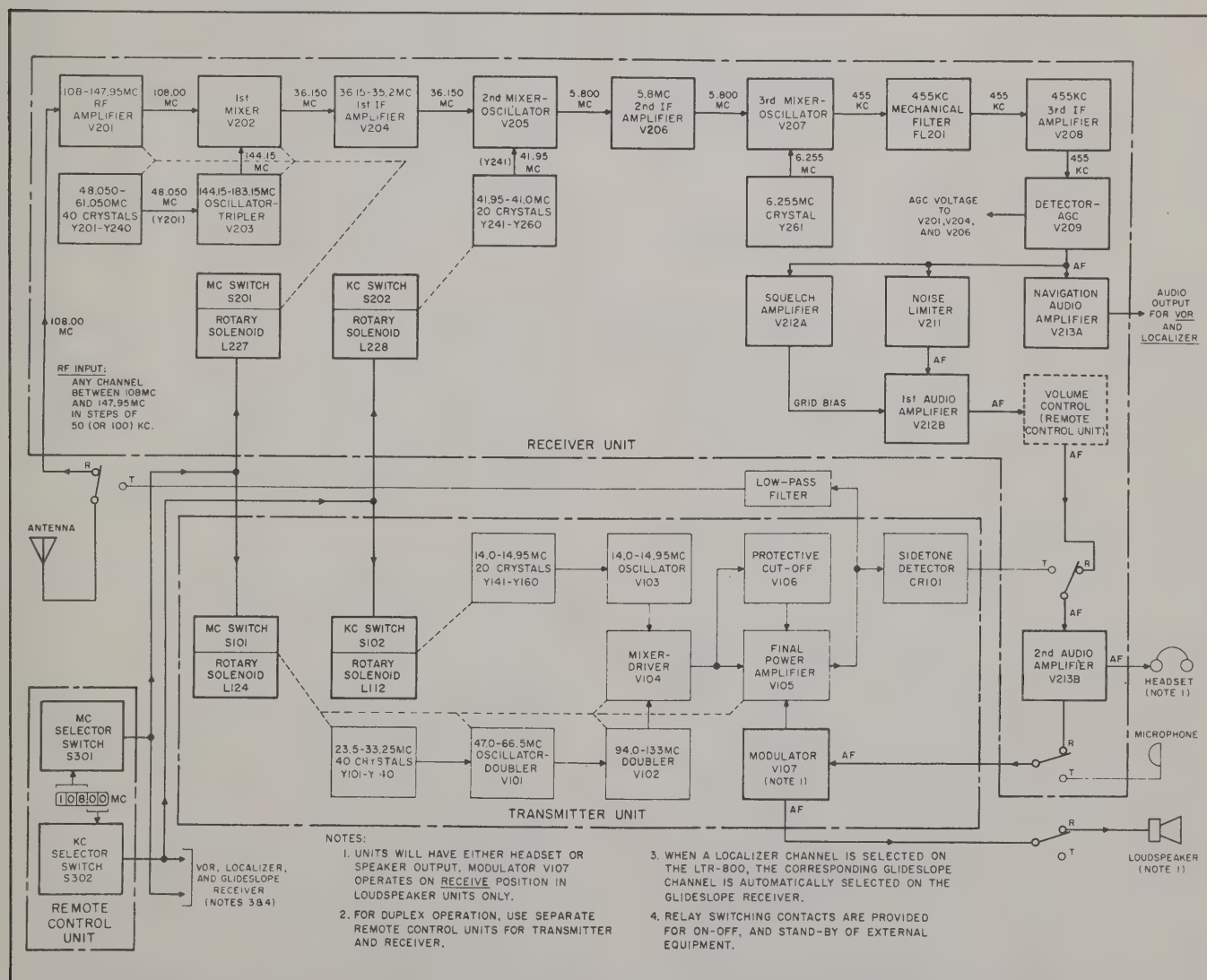


Figure 2-2. LTR-800 Block Diagram, Receiver Operation

d. Receiver Unit Operation

Figure 2-2 is a block diagram showing operation of the LTR-800 receiver unit. The sequence of operation for reception of a 108.00 mc signal is as follows:

MC selector switch S301 in the control head causes rotary solenoid L227 in the receiver unit to rotate MC selector switch S201 to the position required for reception of signals in the 108.00 mc to 109.00 mc range. KC selector switch S302 in the control head causes rotary solenoid L228 to rotate KC selector switch S202 to the position required for reception of 00 kc (.00 mc) signal within the MC range selected by S201.

(1) The signal is received at the antenna and amplified in tuned r-f amplifier V201.

(2) Y201, a 48.50 mc crystal is selected by S201 as the basic frequency determinant of the oscillator section of V203. The plate-grid coupling circuit connects the tripler portion of V203 with the input of Mixer V202.

(3) The resultant of mixing the input signal (108.00 mc) with the output of Tripler V203 (144.15 mc) is the equipment first intermediate frequency, 36.15 mc. This frequency varies between 36.15 mc and 35.2 mc depending upon the frequency being received. (See Table 2-5.)

(4) The input of Mixer V202 is fed to first i-f amplifier V204 which amplifies the signal for delivery to Mixer V205.

(5) Rotary solenoid L228 positions S202 to select crystal Y241 as the basic frequency determinant of the oscillator portion of Oscillator-Mixer V205. This causes operation of the Oscillator at 41.95 mc which, when mixed with the incoming i-f of 36.15 mc, gives the equipment nominal second i-f frequency of 5.80 mc.

(6) The 5.80 mc signal is then amplified by V206 and fed to V207 where it is mixed with the output of the oscillator portion of the tube to produce the equipment nominal third i-f of 455 kc.

(7) Unwanted frequencies resulting from the mixing processes are attenuated in mechanical filter FL-201 and the 455 kc signal is further amplified in third i-f amplifier, V208.

(8) The output of V208 is fed to Detector-AGC rectifier V209 from which d-c AGC voltage is applied to V201, V204, and V206 and the audio component of the received signal delivered to noise limiter V211.

(9) V211 removes the more pronounced voltage peaks from the audio signal and the signal then is amplified and fed to the headset or loudspeaker. Note that there is one extra stage of amplification utilized for speaker units. V107, in the transmitter portion of the equipment, serves as the

transmitter modulator in all units. In speaker output units, it also serves as a final amplifier to obtain the signal amplitude required for satisfactory speaker operation.

2. DETAILED THEORY OF TRANSMITTER OPERATION

a. General

The LTR-800 transmitter includes the same basic circuits as any other VHF transmitter. There is a Frequency Generator, Driver, Modulator, and Final Amplifier. In addition, there is a simple Protective Cut-Off Circuit, which protects the Final Amplifier in the event of the loss of excitation voltage, and a germanium diode sidetone detector.

b. The Frequency Generating Circuits

There are two primary frequency generating oscillators which contribute to produce the final LTR-800 transmitter output frequency. Oscillator V101 is controlled by S101 which is, in turn, controlled from the MC control knob on the control head. V101 (with its two frequency doublers) operates 14 mc below the desired output frequency. The output of a second oscillator (V103) is mixed with the output of V101 to interpolate within the mc range determined by the output of V101. The output of V103 is 14 mc plus a kc value (14.05 mc, 14.10 mc, etc.) determined by the position of S102 which is controlled by the KC control on the control head. The output of the V101 and the multiplied output of V103 are mixed at Mixer-Driver V104 to produce the frequency used to drive the Final Amplifier.

The range of frequencies at each significant point in the circuit is shown for clarity in Figure 2-3. The switch section by which crystals or tuning inductances are selected are shown on the simplified diagram, so that the diagram can be more readily related to the main schematic diagrams. For a complete tabulation of the frequencies present at each point in the circuit for any given transmitter output frequency, refer to paragraph 6b of this section.

(1) Oscillator-Doubler V101 (See Figure 2-3)

V101 is a sharp cut-off pentode that combines the functions of oscillator and frequency doubler. Pin 1 acts as the Oscillator grid, and Pin 6 (the screen grid) acts as the oscillator plate. Feedback is achieved through the interelectrode capacitance of the tube. The frequency determining element of the oscillator is the crystal selected by S101A or C and MC Alternate Relay K101. S101A selects crystals for an even mc transmitter output and S101C crystals for an odd mc output. One position of S101 is used for two MC frequencies (for example, 118 mc and 119 mc are paired) and the operation of K101 (which is also controlled from the MC selector knob on the control head) enables two output frequencies to be derived from this single switch position. (For an explanation of the alternate MC switching system refer to paragraph 5c and figure 2-10 of this section.)

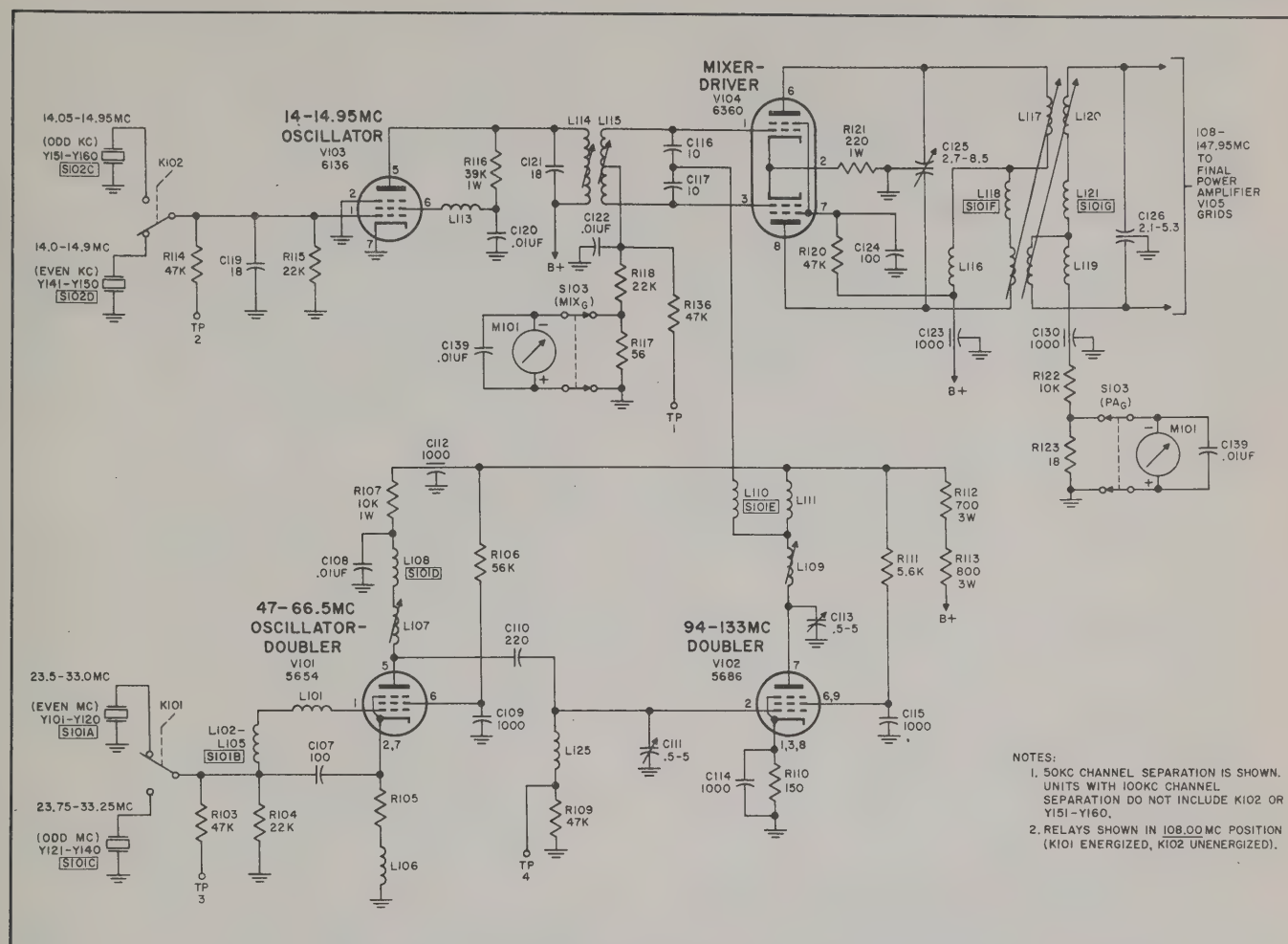


Figure 2-3. Transmitter Frequency Generating Circuits, Simplified Schematic Diagram

The grid circuit of the oscillator is tuned to resonance by L101, a fixed inductance, which is parallel with L102, L103, L104, and L105. These inductances are connected in series through S101B in such a way that one of them is subtracted each time the frequency output of the transmitter is increased 10 mc (or five positions of S101).

The plate of V101 is tuned to double the crystal fundamental frequency produced by the oscillator portion of the tube. Variable inductor L107, in series with tapped inductance L108, accomplishes this harmonic selection. L108 is controlled by S101D so that a predetermined amount of inductance is removed from the circuit for each 2 mc (one position of S101) the frequency output of the transmitter is increased.

(2) Doubler V102 (See Figure 2-3)

The 47 - 66.5 mc output of V101 is coupled through C110 to the grid of Doubler V102 which is a conventional beam-power frequency multiplier. The grid circuit of V102 is resonated to the input frequency by C111. The plate circuit is tuned in the range of 94 - 133 mc by variable inductor L109 in series with tapped inductor L110. The taps of L110 are controlled by S101D in such a way that a portion

of the inductance in series with L109 is removed from the circuit with each 2 mc increase (one position of S101) in the transmitter output frequency.

(3) Oscillator V103 (See Figure 2-3)

Oscillator V103 supplies frequencies in the range of 14.00 through 14.95 mc across double-tuned transformer L114-L115 direct to the grid of Mixer-Driver V104. The crystal determining the output frequency of V103 is selected by S102C and S102D and K102, on the alternate principle, in the same manner that odd and even mc frequencies and selected for V101 by the combination of S101A, S101C, and K101. S102 and K102 are controlled from the KC selector knob on the remote control head of the equipment. When an even hundred kc value is selected (e.g., .10, .20, .30, etc.) K102 is de-energized and one of the crystals in the Y141 through Y150 range is selected by S102D. When a 50 kc step is selected (e.g., .15, .25, .35, etc.) K201 is energized and one of the crystals in the Y151 through Y160 range is selected by S102C. In this manner one position of S102 enables the selection of two frequencies dictated by the position of the KC control on the control head. In units having 100 kc channel separation, crystals are included on S102D only, and K201 is eliminated

from the circuit. Oscillator V103 is tuned-plate, tuned-grid oscillator with the crystal replacing the tuned-grid circuit. Feedback is internal through the plate to grid capacitance, and this, together with inductance L114 and C121, tunes the plate tank circuit.

(4) Mixer-Driver V104 (See Figure 2-3)

The signals from Doubler V102 and Oscillator V103 are mixed in the grid-circuit of Mixer-Driver V104 to derive the final transmitter output frequency. The frequency data for the mixing process which takes place at this point is given in paragraph 6 of this section.

V104 operates push-pull. The signal from V102 is coupled to both grids of the push-pull stage through C116 and C117. The input to the stage from Oscillator V103 appears across opposite ends of the coupling transformer secondary formed by L115.

In the MIX G position, meter M101 is made available to measure the grid current pulled by V104 which is, in part, a reliable way to measure the level of the signals being applied to the tube from V102 and V103. Since the output from V103 is the fundamental frequency at which the oscillator operates, and the output from V102 is, though considerably amplified, the fourth harmonic of Oscillator V101, the output from V103 is considerably stronger than the output from V102, and consequently has a far greater effect on the grid current of V104. Thus meter M101 will read in the green area if its calibration scale with both signals present, but will also often read in the green with only the signal from V103 present. This effect does not in any way impede the efficient operation of the transmitter because of the manner in which the plate circuit of V104 and the grid-plate circuits of the Final Amplifier are tuned. However, the effect should be taken into consideration when trouble-shooting the equipment.

L118, and L117 tune the plate circuits of V104 to the sum of the frequencies introduced from V102 and V103. The signal is inductively coupled through transformer secondary, L120, to the following Final Amplifier Stage. The PA G position of the meter M101 selector switch provides a reliable measurement of the output level from V104 by measuring the grid current drawn by final amplifier V105.

c. Transmitter Output and Modulator Stages

(1) Final Power Amplifier V105 and Protective Cut-Off V106 (See Figure 2-4)

V105 operates as a class B push-pull power amplifier. The grid circuit of the stage is tuned by L120, L121, and C126. The plate circuit is tuned by C127, C128, L123 and the primary of T101. L121 and L123 are tapped inductances which are controlled by sections of S101 in such a way that inductance is added as the output frequency of the

transmitter is lowered. The PA G and P O positions, of meter select switch S103 respectively enable the grid current of V105 and the amount of antenna current to be measured. This allows the rapid localization of trouble to V105, or enables it to be eliminated as a trouble source.

Protective Cut-Off V106 is a beam power pentode. Its function is to prevent excessive power demand by V105 in the absence of an excitation voltage. V106 is normally biased to cut-off by the control bias on the grid of V105 resulting from the application of excitation voltage from Mixer-Drive V104. When, for any reason, excitation is removed, V106 conducts to lower the conduction of V105 by the application of a negative voltage to the screen grid of the Power Amplifier.

(2) Modulator Circuit (See Figure 2-4)

Modulator V107 operates push-pull to apply the voice component of the transmitted signal to the plates and screens of V105. Referring to Figure 2-4, it can be seen that V107 has a second function. With Transmit-Receive relay K204 in the transmit position, the microphone input is coupled through T205 (in the receiver unit) to the grids of V107. In this configuration the circuit acts as a modulator. With Transmit-Receive relay K204 in the Receive position, the output of Second Audio Amplifier 213B is delivered, through plate coupling transformer T204, to T205, and the additional secondary of Modulator T102 is connected to the cabin loudspeaker. In this configuration, V107 acts as a booster amplifier for speaker operation. In headset units, the contacts of K204 performing this switching function are bussed, and the receiver audio output is delivered direct to the headset from V213B through plate coupling transformer T204.

(3) Sidetone Detector CR101

Germanium crystal diode CR101 detects a portion of the modulated output appearing at the transmitter antenna and delivers it, through sidetone level control R287, and Volume control R301, to the grid of V213B. To prevent the occurrence of speaker-to-microphone oscillation, this circuit is not used in equipments having speaker output.

3. DETAILED THEORY OF RECEIVER OPERATION

a. General

Like the transmitter, the LTR-800 receiver is easy to understand, once it is realized that its complexity is due only to the circuits required to obtain its outstanding frequency coverage. The receiver consists of the local oscillator and converter circuits, i-f amplifiers, a detector, noise limiter, and agc circuit, and conventional audio output amplifiers. To simplify the explanation of these various circuits, exact frequency data is not given in this paragraph, but in paragraph 6 of this section. An exact description and full schematic data of the switching system through which receiver frequency changes are made is given in paragraph 5 of this section.

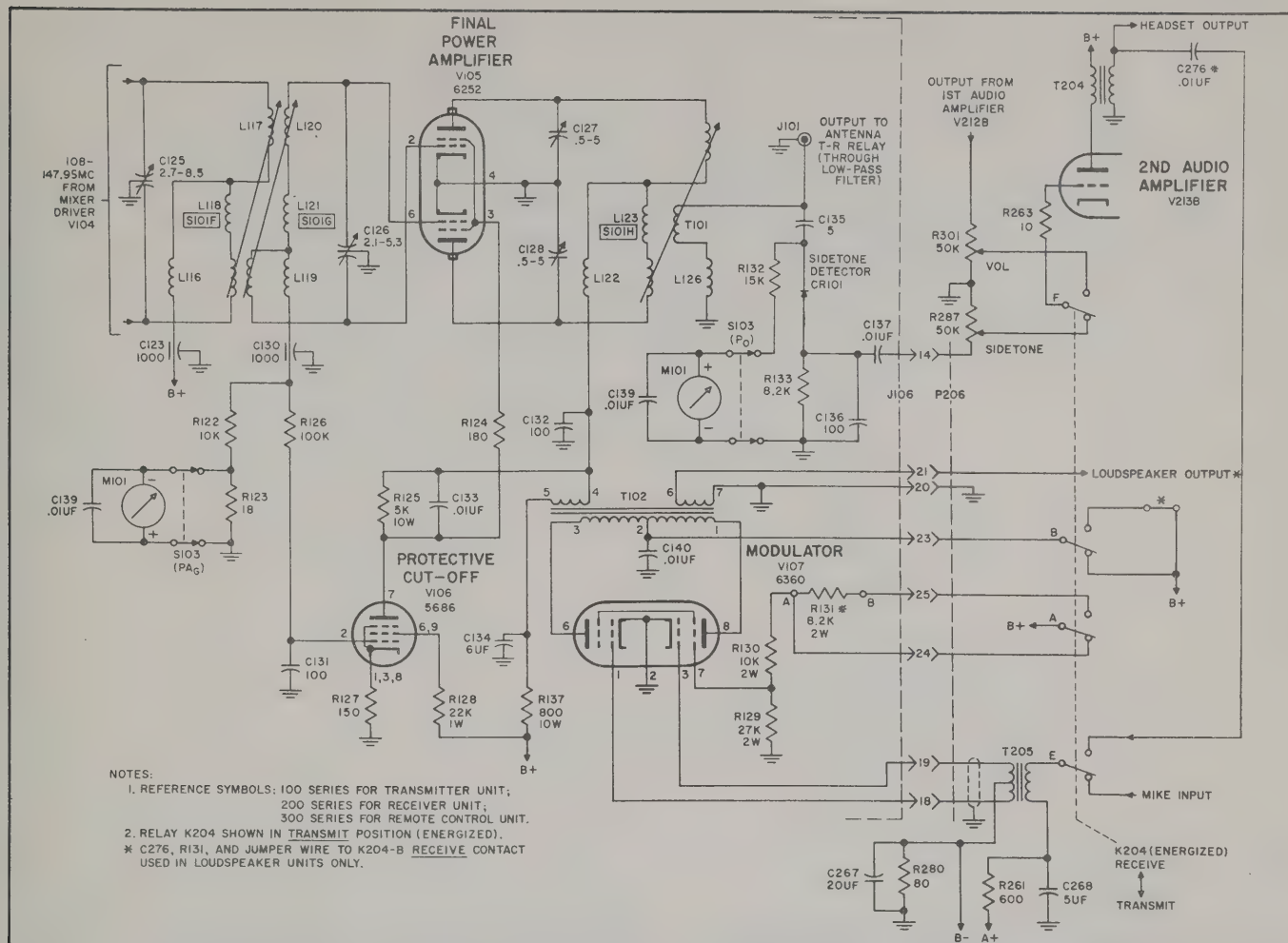


Figure 2-4. Transmitter Output and Modulator Circuits, Simplified Schematic Diagram

b. Receiver Input Circuits

(1) RF Amplifier V201 (See Figure 2-5)

RF Amplifier V201, is a conventional pentode amplifier having a tuned plate and grid. The grid is tuned by the combination of L203, C201, and L202. L202 is a tapped inductance in series with L203. The taps of L202 are controlled by S201A in such a way that the inductance in series with L203 is reduced as the LTR-800 frequency is increased. One tap is subtracted for each advance of 2 mc on the MC control knob, located on the LTR-800 control head. The 2 mc tuning control change required to obtain the one step change of S201 is explained in paragraph 5c of this section. The plate circuit of V201 is tuned in the same manner as the grid by the combination of L204, L205, and C207.

(2) Oscillator-Tripler V203 (See Figure 2-5)

The crystal oscillator portion of V203 operates as a modified Hartley circuit, utilizing the Screen grid (Pin 6) as the oscillator plate, and the control grid (pin 1) as the oscillator grid. The crystals selected by S201E and S201G replace the capacitive tuning element in the grid circuit, while

L202 in series with L233 provides the resonating inductance.

S201 steps one position for every two position change of the MC frequency knob on the LTR-800 control head. In an even MC position (108 mc, 110 mc, 112 mc, etc.) K201 is energized and places the crystal in the V203 grid circuit selected by S201E from the Y201 through Y220 crystal bank. In an odd MC position K201, is de-energized and places the crystal in the circuit selected by S201G from the Y221 through Y240 crystal bank. For an explanation of the operation of K201 and S201, refer to paragraph 6. For an explanation of the mixing sequence of the receiver, and a tabulation of the crystals selected for Oscillator V203 when frequencies are selected at the control head, refer to paragraph 6b and table 2-5.

(3) First Mixer V202 and First I-F Amplifier
V204 (See Figure 2-5)

Oscillator V203 operates between 35.2 and 36.15 mc above the radio frequency delivered from first r-f amplifier V201. (See paragraph 6b and table 2-5.) The two frequencies are fed to first Mixer V202 which is a conventional pentode amplifier having its plate circuit broad tuned by L214 to select

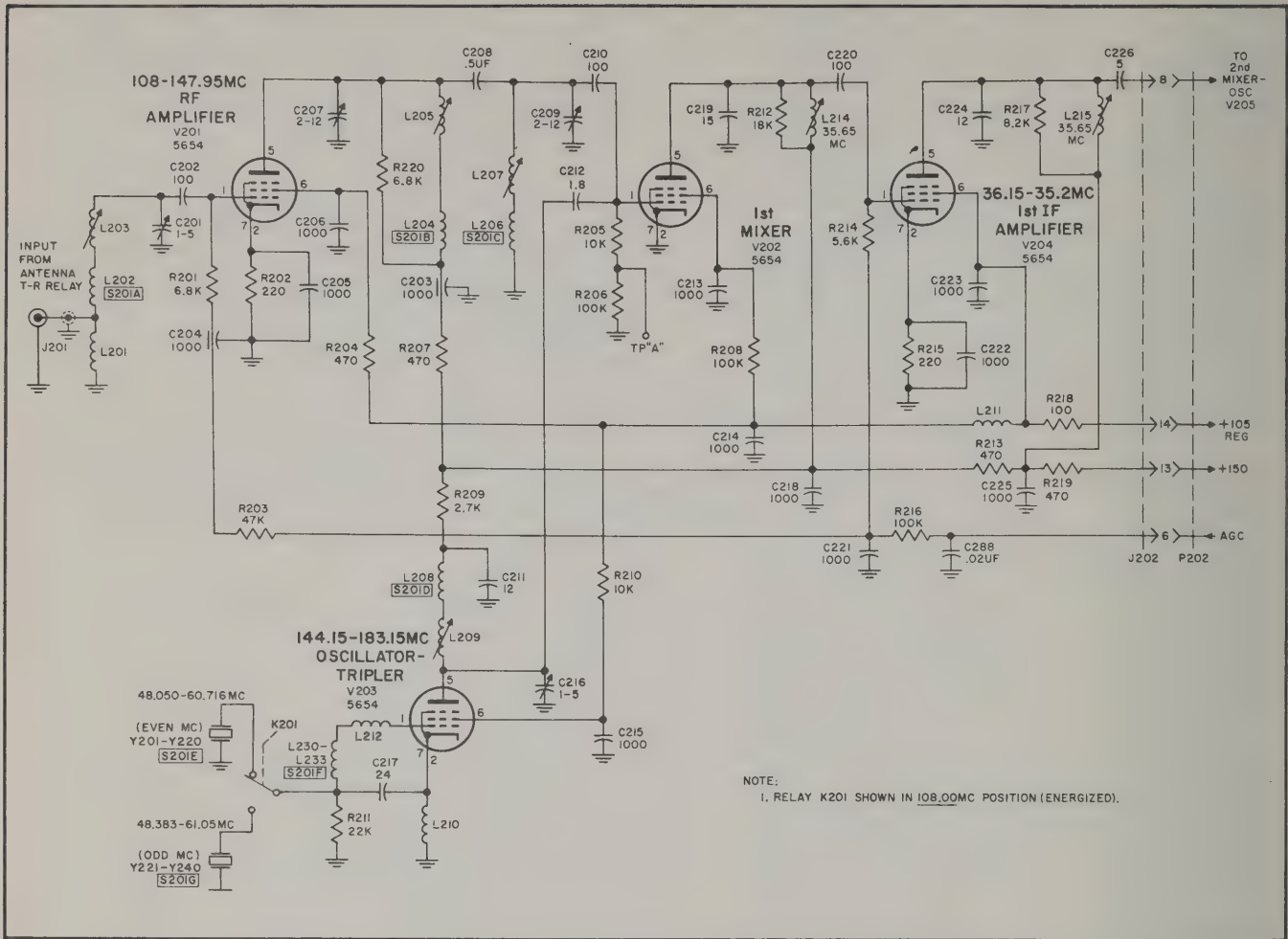


Figure 2-5. Receiver Input Circuits, Simplified Schematic Diagram

the difference frequency resulting from the subtraction of the r-f input of V201 from the output of V203.

The output signal of V202 is coupled through C220 to the grid of i-f amplifier V204 which amplifies the signal and further attenuates unwanted mixing products present in the output of V202 by virtue of its plate tuning circuit which is identical with that used on the plate of V202.

c. 5.8 mc and 455 kc Converter-Amplifier Stages

(1) Mixer-Oscillator V205 and Second I-F Amplifier V206 (See Figure 2-6)

V205 operates as both an oscillator and a mixer. Pin 7 acts as the mixer grid, Pin 1 the oscillator grid, and Pin 6 the oscillator plate. The frequency at which the oscillator operates is controlled by a crystal which is placed in the grid circuit by K202 and S202A, or S202B. S202A, S202B and K202 operate in the same way as the even and odd mc crystals controlling V203. (Paragraph 3b, above.) S202 is controlled from the KC frequency control knob on the LTR-800 control head. K202 is de-energized when an even (.10, .20, .30) KC reading is selected and a crystal from the Y241-

Y250 bank is selected by S202A as the basic frequency determinant for the oscillator portion of V205. When an odd KC value is chosen on the control head (.15, .25, .35) K202 is energized and the crystal selected from the Y251 through Y260 bank by S202A. In models of the LTR-800 having 100 kc channel separation, K202 is not included in the circuit, and only S202A is equipped with crystals. The crystals selected for various frequencies is given in table 2-5, paragraph 6b, and an explanation of the switching system in paragraph 5 of this section.

Mixing of the input from first i-f amplifier V204 and the output of the oscillator section of V205 is accomplished in the common electron stream of the two signals. V205 is plate tuned by T201 to select the difference between the two frequencies.

5.8 mc is the nominal second i-f frequency of the LTR-800. The frequency varies, to some extent, with the input frequency being received by the equipment. (See paragraph 6 and table 2-5.)

V206 is a conventional pentode amplifier having its grid and plate tuned to 5.8 mc by the secondary of T201 and the primary of T202, respectively.

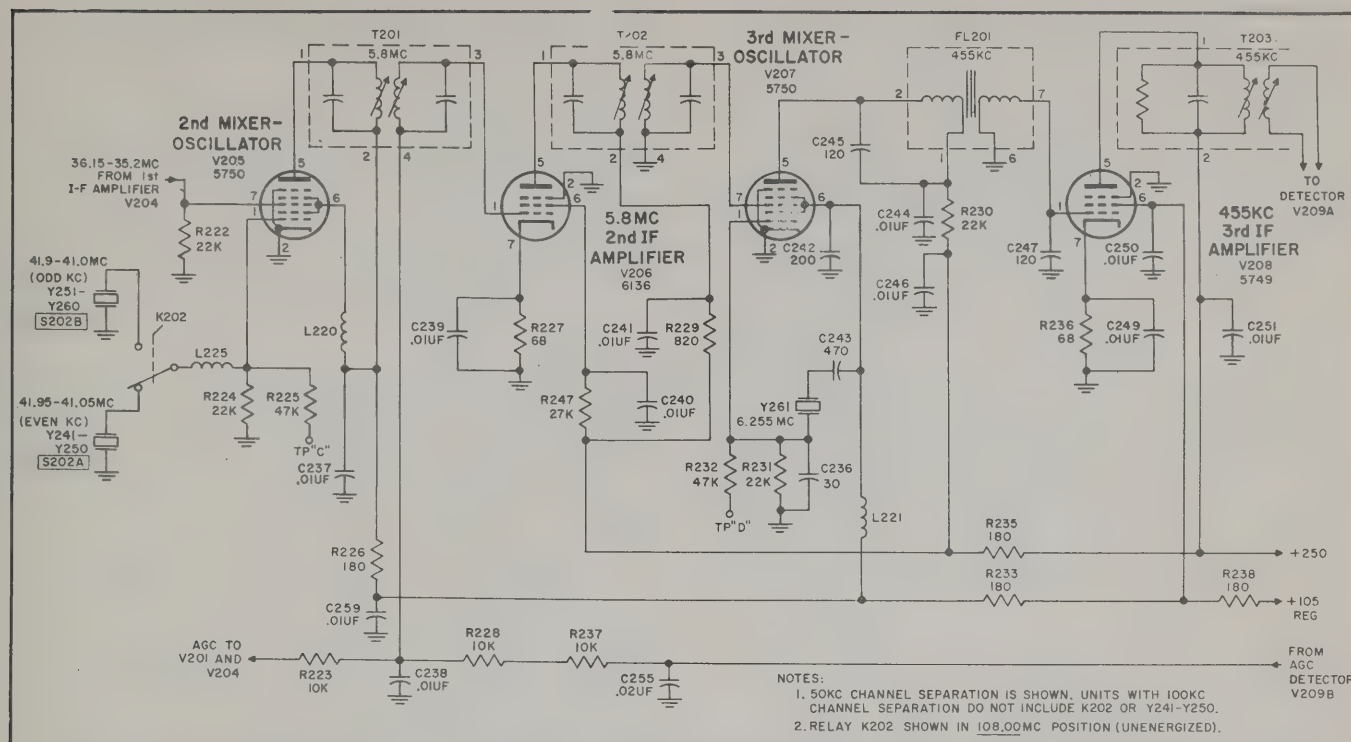


Figure 2-6. 2nd and 3rd I-F Stages, Simplified Schematic Diagram

(2) Mixer Oscillator V207 and Third I-F Amplifier V208 (See Figure 2-6)

V207 operates as both a mixer and an oscillator utilizing the same principles of operation as V205, described above. The frequency determinant for the oscillator section of the tube is crystal Y261 which operates at a frequency of 6.255 mc. This frequency is mixed with the nominal 5.8 mc i-f to derive a final i-f of 455 kc (nominal, see paragraph 6 and table 2-5).

The output of V207 is delivered to mechanical filter FL201 which operates on the principle of mechanical resonance to provide passage for the 455 kc i-f signal while sharply attenuating spurious frequencies resulting from the preceding mixing processes.

V208 is a conventional pentode amplifier having its grid circuit tuned by FL201 and its plate circuit tuned by the primary of T203. The output from the secondary of T203 is fed to the receiver's detector circuit.

d. Receiver Audio Stages

(1) Receiver Audio Output Circuit

The input to detector V209A is fed from the secondary of T203. V209A rectifies the i-f signal, producing the a-f modulation component which appears across the tapped diode load comprising R240, R252, and R251. A portion of the audio is coupled through C270 to the control grid of Navigation Amplifier V213A. This signal is not subject to noise limiter action nor squelch control.

(2) Noise Limiter Circuit

Dual diode V211 forms a series-shunt type noise limiter circuit. Both halves of the tube are biased by the d-c appearing at the junction of R240 and R252 as a result of the filtering action of the pie network formed by C252, R239, and C253. The d-c level at this point is a function of the amplitude of the r-f signal across T203. A higher signal level causes the d-c component appearing at the junction to go more positive. In the normal state, when the signal level is below the predetermined point established by the receiver agc action, V211A acts as an extremely low reactance capacitor, allowing the audio output of the detector developed across R251 to be coupled through C263 to first audio amplifier V212B. Because of the time constant of the agc circuit, a sharp noise pulse will not affect that circuit, but appear across T203. The d-c component of this sharp pulse will cause V211B to conduct which, in turn, changes the bias of V211A in such a way as to cause it to rectify the noise impulse. In this manner, a much more effective noise limiter is developed than is possible with the standard variety, since even noise peaks in signals of very low level are removed.

(3) Squelch Circuit

Squelch Amplifier V212A is also controlled by the d-c voltage appearing at the junction of R240 and R252. In the normal state (normal signal) V212A is cut off by the negative bias developed across R262 and applied to the control grid of the tube by the presence of the rectified signal at the junction of R240 and R252. When the signal is removed, the junction goes more negative, thus

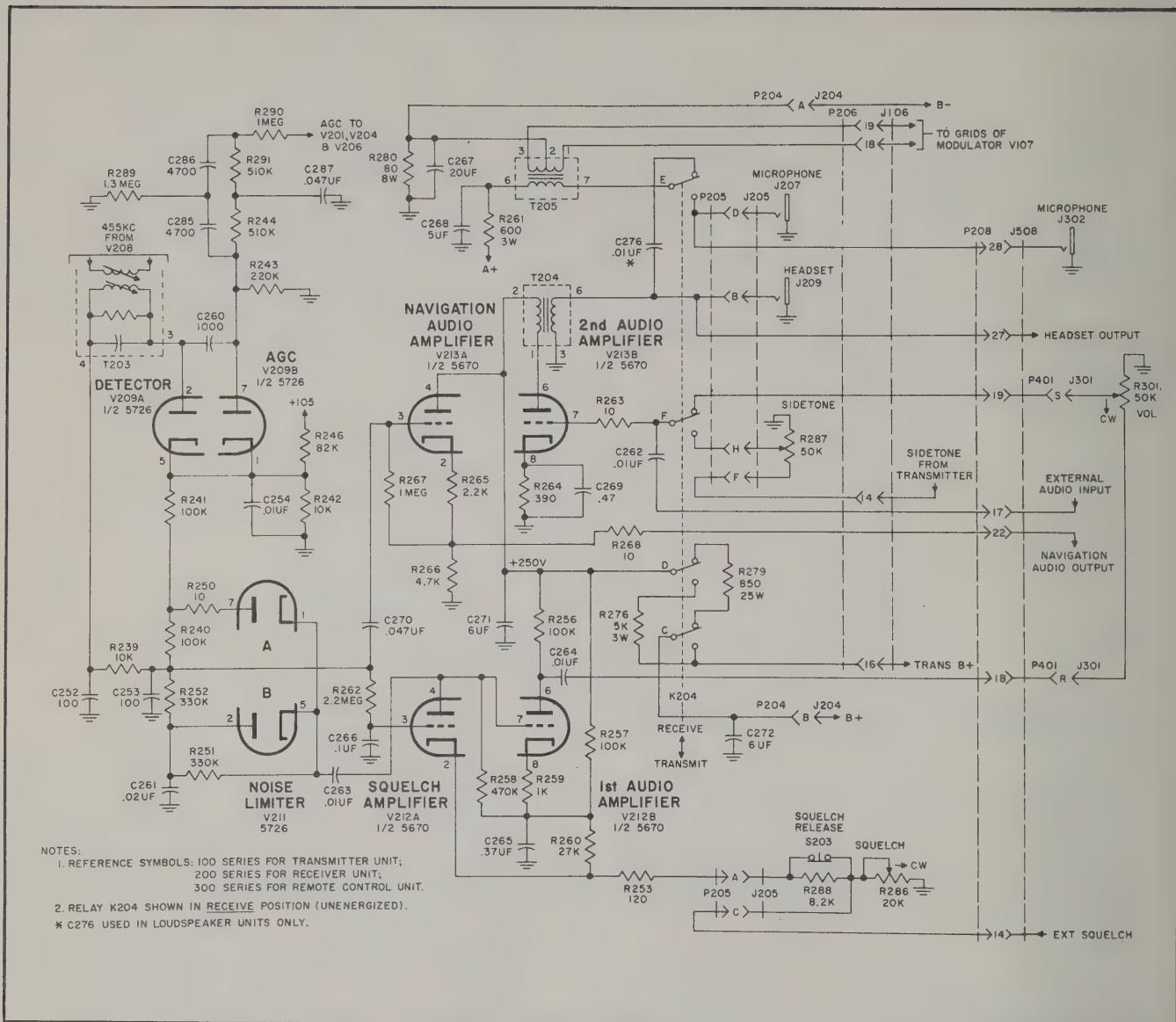


Figure 2-7. Receiver Audio Stages, Simplified Schematic Diagram

causing the grid of the Squelch amplifier to go more positive. When the signal level is low enough, V212A begins to conduct, developing a voltage across R258 which causes First Audio Amplifier V212B to be cut off, effectively preventing the reception of undesirable hash in the absence of meaningful signals.

The point at which V212A is cut off is adjusted by varying the potential on the cathode through the adjustment of R286.

(4) Audio Output Circuit

The audio output amplifying circuit of the receiver for headset operation differs from that used for speaker operation. For headset operation, the output of detector V209A is developed across R251 and coupled through V211A (see above) and C263 to the grid of First Audio Amplifier V212B. The triode amplifies the signal in a conventional way.

The output of V212B is coupled through C264 to Volume control R301, located in the LTR-800 control head and returned, through the "F" contact of transmit-receive relay K204, to the grid of Second Audio Amplifier V213B. The signal is again amplified in this stage and then coupled through T204 to headset receptacle J209. A second parallel output is available at Pin 27 of J208 for wiring into the aircraft intercom system if desired.

For speaker operation, the connection of J209 is opened and the output of T204 coupled through C276 to contact "E" of transmit-receive relay K204. From contact "E" the signal is applied across the primary winding of microphone transformer T205, to be applied to modulator V213. The remainder of this circuit is explained in sub-paragraph 2c of this section.

(5) Navigation Amplifier Output Circuit

The navigation output is taken from the a-c component developed by detector V209 across R240, and thus is not subject to either squelch cut-off, nor noise limiter action. The signal is coupled through C270 to the grid of V213A, a cathode follower. The output developed across R266 is fed to Pin 22 on J208 and, since it is delivered from a cathode follower, is high impedance.

(6) AGC Circuit

AGC Rectifier V209B rectifies the portion of the output from T203 coupled to the plate circuit through C260. The circuit is conventional and the d-c output developed across the timing network is applied to the grids of V201, V204, and V206.

4. POWER SUPPLY

a. High Voltage Power Supply (See Figure 2-8)

The LTR-800 utilizes a dynamotor for its high voltage (B+) power supply. The dynamotor output is 350 vdc (max), but it is dropped for some applications to lower values. The portion of the output fed to the screen grids of V201 through V208

in the receiver is regulated 105 vdc to achieve better frequency stability. The regulator is an ionization type which is biased to discharge at 105 vdc. This method of regulation is sufficient and reliable for the equipment since the voltage applied to the line from the dynamotor is considerably more than 105 vdc and the regulator is therefore in a constant state of discharge to hold the voltage fed to the tubes to $\pm 5\%$.

b. Low Voltage Power Supply

The low voltage used in the LTR-800 is supplied by the primary aircraft power supply. It is not subject to regulation, and is applied as filament voltage to all tubes and used to operate the Rotary Solenoid switching system and all other relays throughout the equipment.

5. OPERATION OF FREQUENCY SELECTION SWITCHING SYSTEM

a. General

The Model 5454 Control Head is connected to the frequency determining circuits of the transmitter and receiver through a system of rotary solenoids and double-pole, single-throw relay actuated

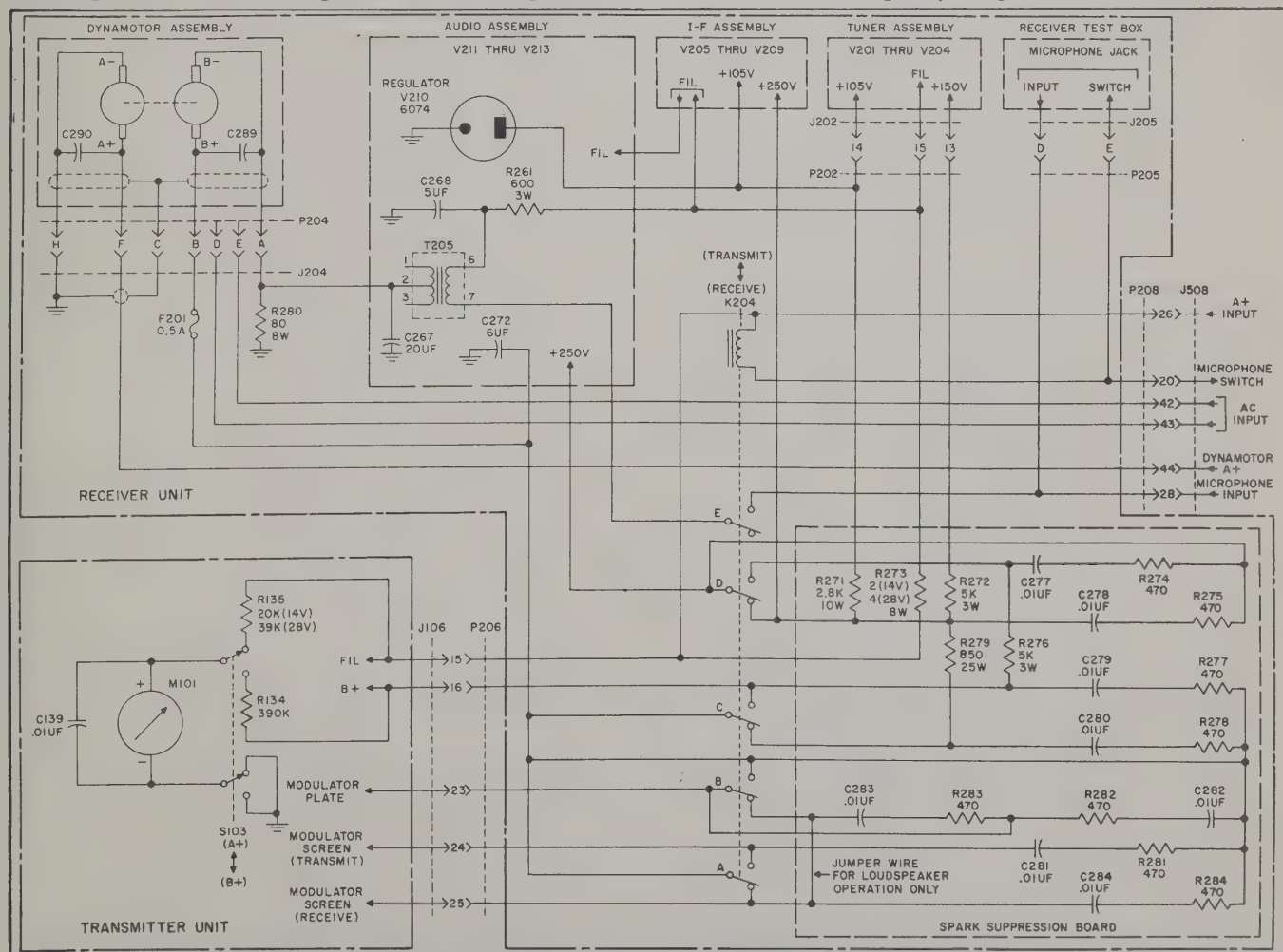


Figure 2-8. Power Supply Circuit, Simplified Schematic Diagram

switches. This method of connection enables a digital frequency presentation to be used in the Control Head and eliminates the necessity of a mechanical connection between the Control Head and the receiver.

b. Rotary Solenoids (Stepping Relays)

Rotary Solenoids L112, L124 in the transmitter and L127, L128 in the receiver are positioned by control wafers mechanically connected to the mc and kc control knobs on the control head. Rotary solenoids of the type used in the LTR-800 are often called "stepping relays" because they "step" from one position to the next.

The principle of Rotary Solenoid operation is as follows:

(1) A Rotary Solenoid (See Figure 2-9A) comprises a solenoid and a plunger, an inclined plane, ratchet, rotor shaft and a "homing" wafer with an interruptor switch and a detent mechanism. When the solenoid coil is energized, the plunger is attracted axially. This axial motion is converted by the inclined plane to a short rotary motion and forward axial motion.

(2) The ratchet transmits this motion to a second driven shaft, imparting a purely rotary motion to the second shaft. A detent mechanism determines the stop position of the driven shaft. At the same time, the interruptor switch is opened by a cam, the solenoid de-energized, and the plunger forced back to its original position by a spiral spring. The driven shaft however, remains at the position to which it was moved. This action completes one cycle of operation, or one "step".

(3) The basic control circuit used to cause the rotary solenoid to cease stepping at a predetermined point (index to a designated position) consists of two switches; one through which the operator places a voltage upon a given index wire ("control" wafer) - and the other which enables the rotary relay to find the wire upon which the voltage has been placed ("homing" wafer).

(4) Figure 2-9B illustrates the operation of this basic control circuit. In Step 1 of the figure the system is at rest, since the circuit is open through contact 1 of the rotary solenoid homing wafer. In Step 2 the system has been placed in operation by turning the control wafer to position 2 - this action completed the circuit through homing wafer contact 2 and caused the cycle of operation described in (2), above, to take place. The cycle of operation continues in steps until the open portion of the control wafer sector reaches contact 2. At this point, the circuit is open once more and the system is again at rest.

This electrical sequence of events describes the basic principle used to obtain frequency control in the LTR-800. The LTR-800 circuit is much more complex than that described above. In the circuit described, one wire is required for each switch

position desired. In the LTR-800, the contact sector form of the control and homing wafers is varied to decrease the number of wires required to obtain many switch positions. The principle is however, the same; i.e., that of completing a circuit manually at the control head through the control wafer, to enable the rotary solenoid to step until its homing wafer opens the circuit.

c. Frequency Selection and Alternate Relay Operation

The LTR-800 transmitter contains one ganged switch which selects crystals and other tuning elements required to determine its output frequency in megacycles ("mc" control) and a second ganged switch which selects crystals required to determine the output frequency fractional value within the megacycles figure selected ("kc" control). Both switches are driven by rotary solenoids. The receiver also has two ganged switches driven by rotary solenoids selecting tuning elements required for a given setting of the control head. The function and identification symbols of the switches are as follows:

(1) Rotary solenoid L124 drives rotary switch S101 to select transmitter output in mc.

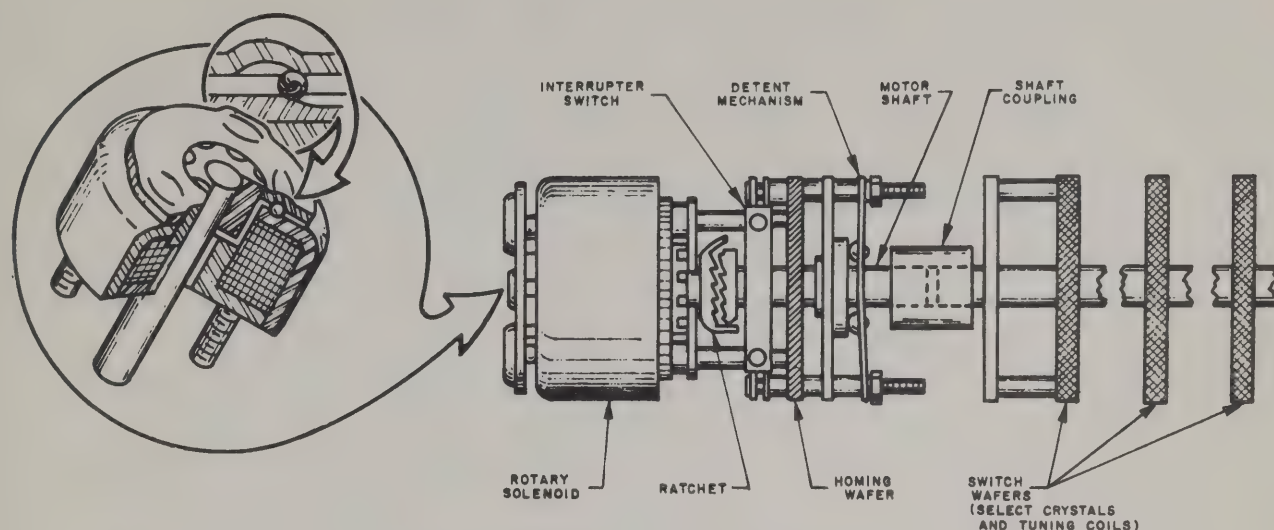
(2) Rotary solenoid L112 drives rotary switch S102 to select transmitter output in kc.

(3) Rotary solenoid L227 drives rotary switch S201 to select receiver output in mc.

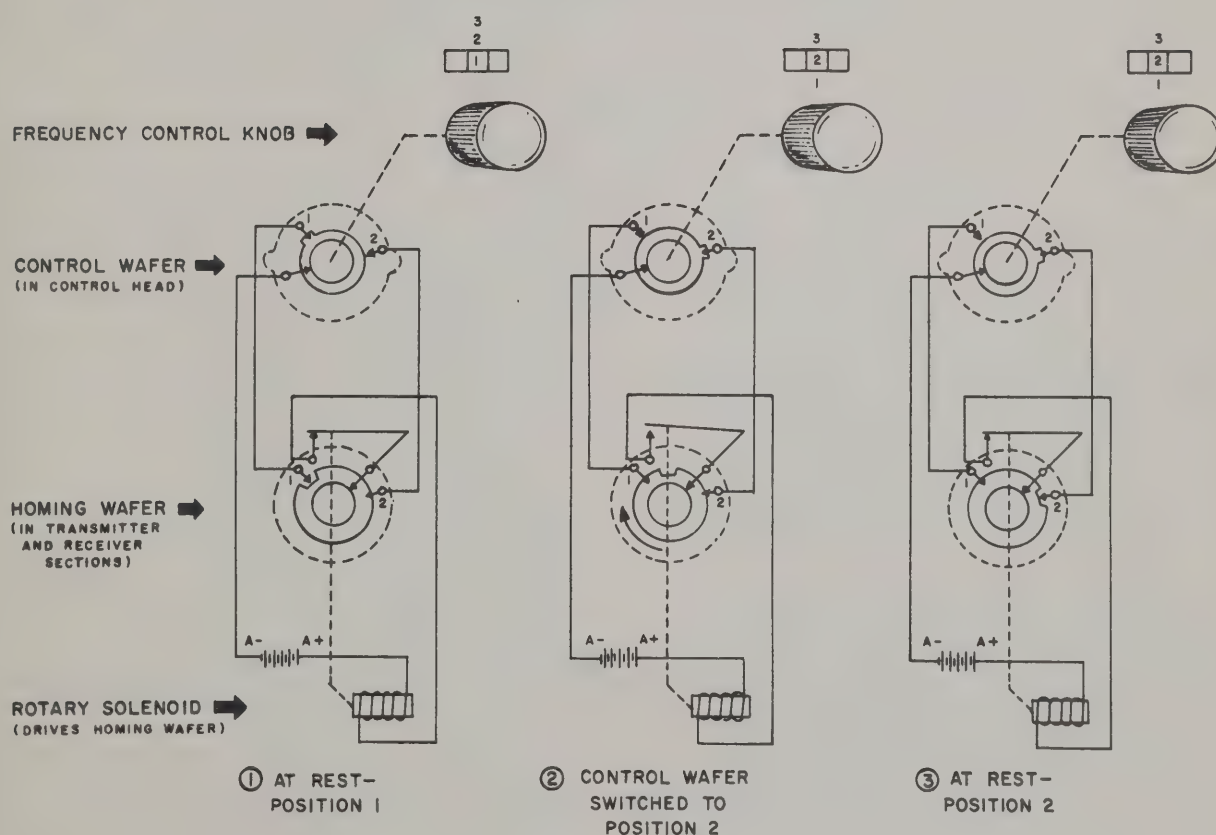
(4) Rotary solenoid L228 drives rotary switch S202 to select receiver output in kc.

These switches and relays select crystals and tuning elements necessary to tune the transmitter-receiver for operation at a frequency selected on the control head. Selection of a frequency at the control head causes a rotary solenoid to cycle until the crystals corresponding to the selected frequency are available.

In the transmitter and receiver, the solenoids selecting the mc portion of the desired frequency have 24 possible positions. Only 20 of these are used. 40 positions, however, are required to obtain the desired frequency range. To double the number of positions possible, an additional relay has been added to the system (Figure 2-10). The odd mc crystals are arranged about one wafer and there are 20 of them. The 20 even mc crystals are arranged about a second wafer. The Alternate Selector relay selects an odd frequency crystal or an even frequency crystal to be the basic frequency determinant used in the oscillator concerned. This relay alternates between energized and unenergized positions as the mc control knob is rotated through its 40 possible positions. When the knob is rotated to an odd mc value such as 109 mc, the code changeover relay is unenergized and the rotary solenoid drives the frequency selector switch to the position required to select a crystal for 109 mc. At the same time, however, the even frequency wafer is also in position to select 110 mc.



A. MECHANICAL DETAILS



B. HOW THE ROTARY SOLENOID STEPS POSITIONS

Figure 2-9. Rotary Solenoid Operating Principles

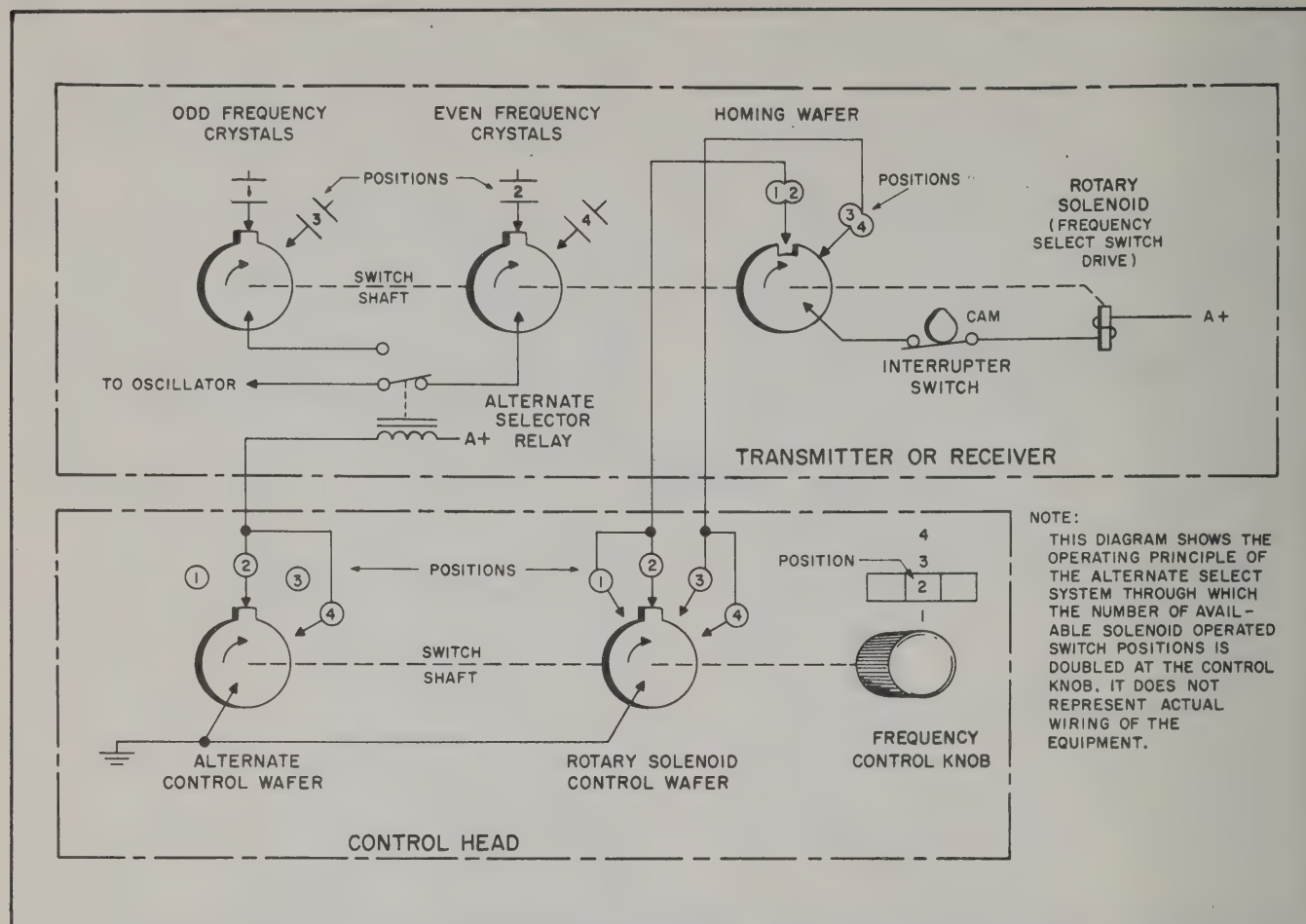


Figure 2-10. Operation of Alternate Relays K101, K102, K201, and K202

Motion of the control head knob to 108 mc does not affect the rotary solenoid control circuit and the rotary solenoid remains at rest. However, the alternate control wafer closes the circuit of the alternate selector relay, which now selects the 108 mc crystal. The next step of the control knob to 111 mc causes the rotary solenoid to step one position and the alternate selector relay to de-energize.

K101 and K201 are the mc alternate selector relays in the transmitter and receiver. Similarly, the 10 position kc selector rotary solenoids in both transmitter and receiver, operate on the same principle although only 10 rotary solenoid positions are used and the alternate selector relay (K202 in the receiver and K102 in the transmitter) select alternately 100 kc and 50 kc steps. For kc selection, the relay is de-energized to select even kc steps (.10, .20, .30, etc.) and energized to select odd kc steps (.15, .25, .35, etc.). In units having 100 kc channel separation, the alternate selector relays are not included.

d. KC Control Switching Circuit

(1) KC Control System Operation

The KC frequency control circuit is shown in Figure 2-11. S302A, operated by the KC control knob on

the control head, is connected to S102A, the homing wafer for L112, in the transmitter unit. L112 turns to select the crystals required for the generation of kc frequencies (within the range of the mc frequency selected) as tabulated in paragraph 6b of this section. For simplex operation (transmitter and receiver frequency selected simultaneously from a single control head) S102B is used as the control wafer for the receiver kc control switch. In the receiver, S202C is the homing wafer for rotary solenoid L228.

When duplex control is used (control of the receiver and transmitter frequencies separately from two different control heads), the same connections are utilized between one control head and the transmitter, but the receiver kc control connections are made from a second control head to Pins 36, 37, 38, 39, and 40 on P208, and P203 is connected to J203 instead of to J103. This connection can be traced by referring to the main schematic diagram in this manual and examining the connections labelled "DUAL CONTROL HEAD KC TUNING".

KC Alternate Control wafer S302C is on the same shaft in the control head as S302A. The wafer operates on the principle described in paragraph 5c, above, to alternately open and close K102 and K202.

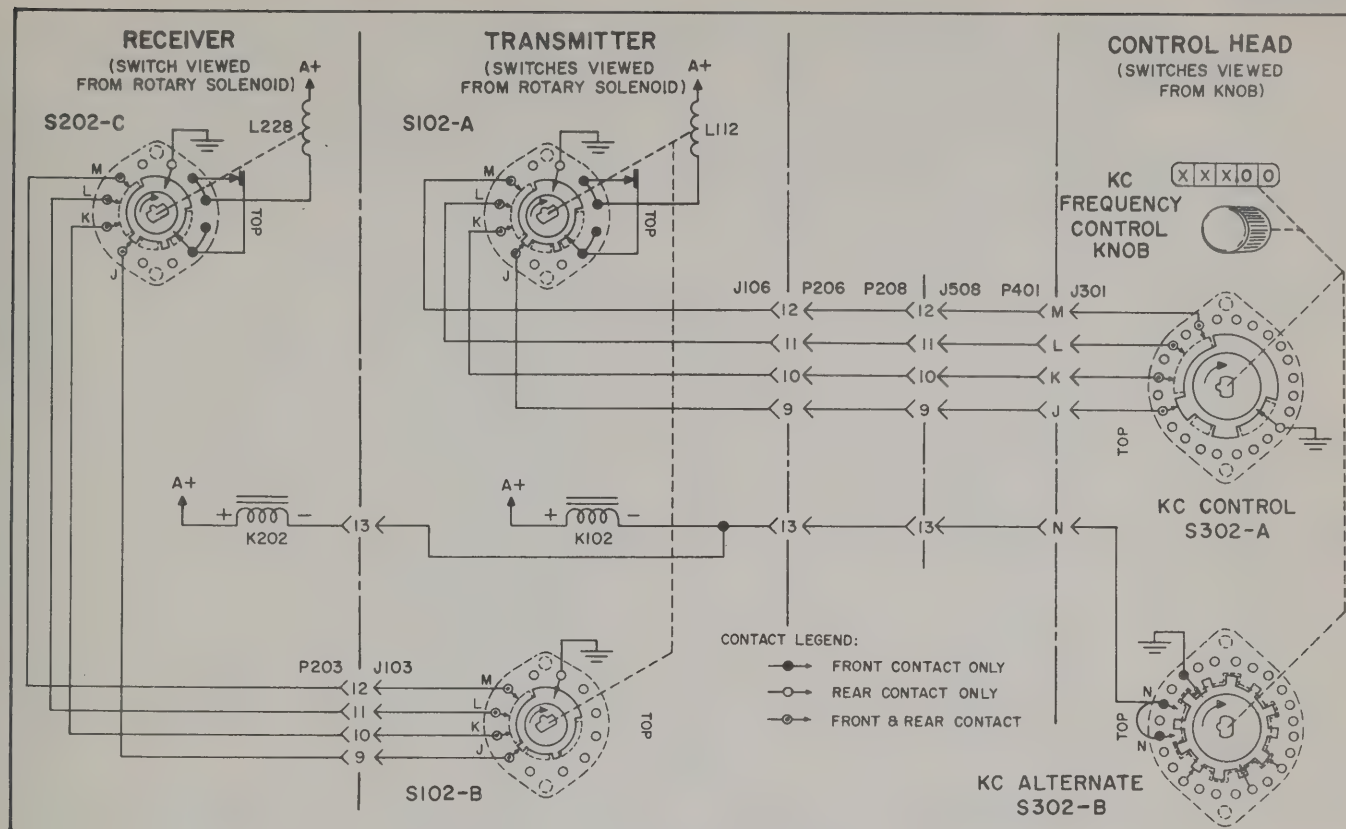


Figure 2-11. KC Control Switching Circuit

When the frequency control knob selects an even kc value (.00, .10, .20, etc.) the relays are de-energized. When an odd kc value is selected (.05, .15, .25, etc.) the relays are energized. Although the connection of a single wire at S302B would fulfill the electrical requirements for operation of the kc alternate relays, two contacts are utilized to give adequate current carrying capacity for both relays.

(2) KC Control System Continuity Pattern

Paragraph 5 in the Maintenance Procedures Section gives a procedure for localizing trouble within the switching system of the equipment. When the trouble has been localized to a single unit in the system, continuity checks will isolate the faulty component. To expedite trouble localization and isolation, refer to paragraph 5 of section III before using this table.

e. MC Control Switching Circuit

(1) MC Control System Operation

The MC control circuit is shown in Figure 2-13. S301A and B are connected through Code-Change-over wafer S301D to S101K, the homing wafer for L124 in the transmitter unit. S101J, the control wafer for L227 in the receiver, is driven by L124. The system is thus cascaded in the same way that the KC system, explained in sub-paragraph d, above, is connected for simplex operation. For duplex operation, the connection between J103 and

P203 is broken, and a second control head, for receiver frequency control, is connected to Pins 29, 30, 31, 32, 33, and 34 of J208, and P203 is connected to J203. To trace this circuit, refer to the main schematic diagram and trace the wires labelled "DUAL CONTROL HEAD MC TUNING".

With respect to the MC transceiver switching control, the circuit comprising S301A, B, and D in the control head is electrically the same as S101J in the transmitter. The additional wafers are required in the control head to take care of the auxiliary equipment switching described in sub-paragraph f, below.

MC Alternate control wafer S301C controls relays K101 and K201 in the same way as the KC alternate control wafer described in sub-paragraph d, above, controls KC alternate relays K102 and K202. The MC alternate relays, however, are energized on even MC frequency selections (108.00, 110.00, etc.) and de-energized on odd MC selections (109.00, 111.00, etc.)

(2) MC Control System Continuity Pattern

Paragraph 5 in the maintenance procedures section gives a procedure for localizing trouble within the switching of the equipment. When the trouble is localized to a single unit in the system, continuity checks will isolate the faulty component. To expedite trouble localization and isolation, refer to paragraph 5 of section III before using this table.

TABLE 2-1. KC CONTROL SWITCHING SYSTEM CONTINUITY PATTERN

Frequency Control Setting	Pins of J301					Rotary Solenoid Position	Pins of J208 (Transmitter Test)				Pins of P203 (Receiver Test)			
	Switch Control K				KCAlt.		9	10	11	12	9	10	11	12
	J	K	L	M	N									
XXX.00		x	x	x		1	R	x	x	x	R	x	x	x
XXX.05		x	x	x	x	1	R	x	x	x	R	x	x	x
XXX.10	x		x	x		2	x	R	x	x	x	R	x	x
XXX.15	x		x	x	x	2	x	R	x	x	x	R	x	x
XXX.20		x		x		3	R	x	R	x	R	x	R	x
XXX.25		x		x	x	3	R	x	R	x	R	x	R	x
XXX.30	x		x			4	x	R	x	R	x	R	x	R
XXX.35	x		x		x	4	x	R	x	R	x	R	x	R
XXX.40	x	x		x		5	x	x	R	x	x	x	R	x
XXX.45	x	x		x	x	5	x	x	R	x	x	x	R	x
XXX.50		x	x			6	R	x	x	R	R	x	x	R
XXX.55		x	x		x	6	R	x	x	R	R	x	x	R
XXX.60			x	x		7	R	R	x	x	R	R	x	x
XXX.65			x	x	x	7	R	R	x	x	R	R	x	x
XXX.70				x		8	R	R	R	x	R	R	R	x
XXX.75				x	x	8	R	R	R	x	R	R	R	x
XXX.80						9	R	R	R	R	R	R	R	R
XXX.85					x	9	R	R	R	R	R	R	R	R
XXX.90	x					10	x	R	R	R	x	R	R	R
XXX.95	x				x	10	x	R	R	R	x	R	R	R

Notes:

1. An "X" in the square beneath a connector pin indicates continuity to ground.
2. An open square beneath a connector pin indicates the circuit is open to ground.
3. An "R" in the square beneath a connector pin indicates 15 ohms resistance to ground in 27.5 vdc unit 7 ohms to ground in a 13.75 vdc unit.
4. Rotary solenoids may be hand stepped by rotating back plate to detent limit to step switch one position. Orientation for position 1 is shown in Figure 2-12. Position 2 is next clockwise detent "click", position 3 is next clockwise detent "click", etc.
5. MC control setting has no bearing on these measurements.

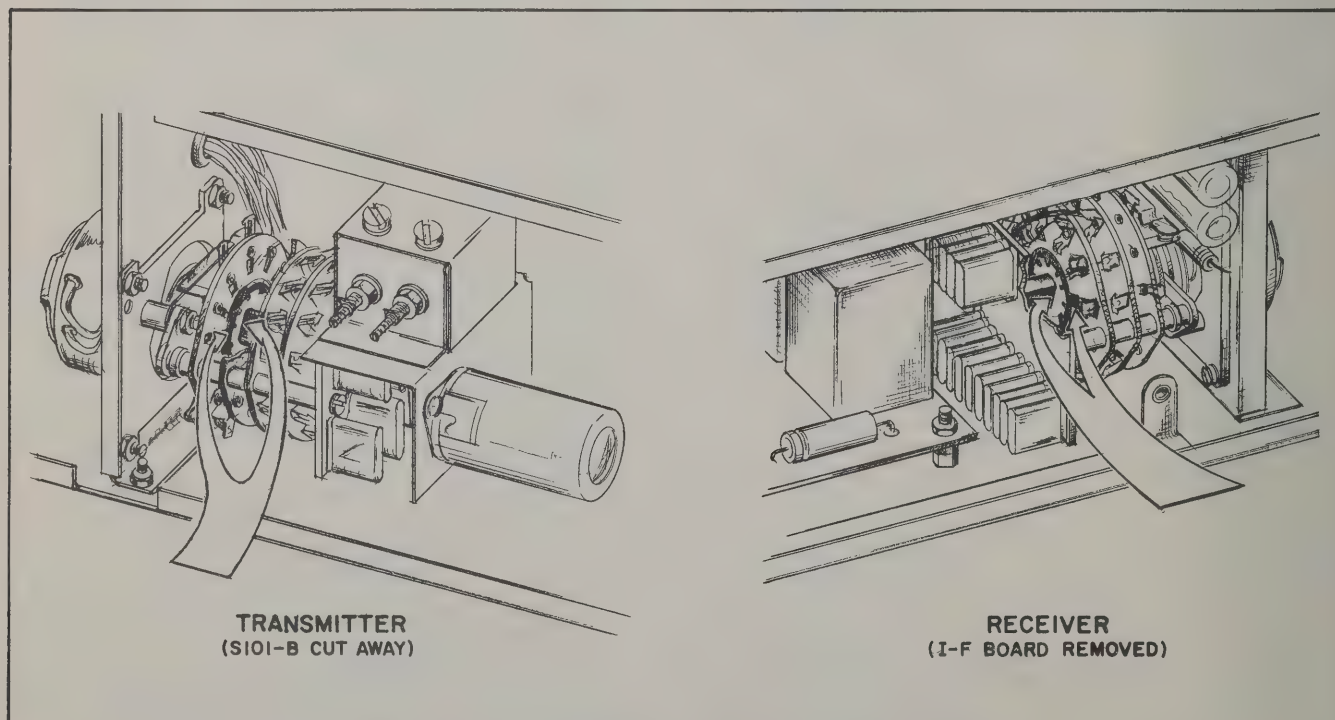


Figure 2-12. Orientation for KC Selector Switch Position 1

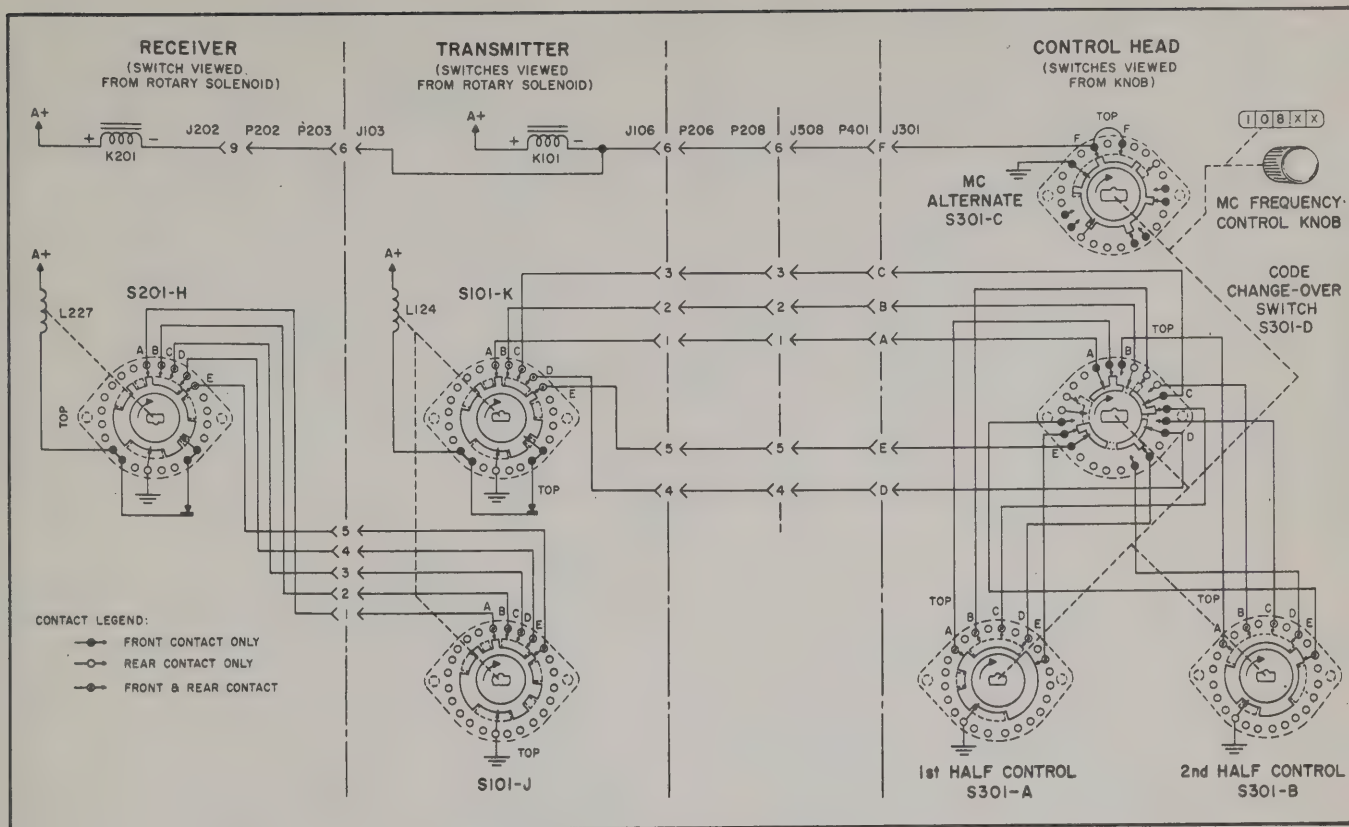


Figure 2-13. MC Control Switching Circuit

TABLE 2-2. MC CONTROL SWITCHING SYSTEM CONTINUITY PATTERN

Frequency Control Setting	Pins of J301						Rotary Solenoid Position	Pins of J208 (Transmitter Test)					Pins of J203 (Receiver Test)				
	Switch Control					MCAlt.											
	A	B	C	D	E			F	1	2	3	4	5	1	2	3	4
108.XX		x	x	x		x	1	R	x	x	x	R	R	x	x	x	R
109.XX		x	x	x			1	R	x	x	x	R	R	x	x	x	R
110.XX	x		x	x	x	x	2	x	R	x	x	x	x	R	x	x	x
111.XX			x	x	x		2	R	R	x	x	x	R	R	x	x	x
112.XX		x		x	x	x	3	R	x	R	x	x	R	x	R	x	x
113.XX				x	x		3	R	R	R	x	x	R	R	x	x	x
114.XX	x		x		x	x	4	x	R	x	R	x	x	R	x	R	x
115.XX	x		x		x		4	x	R	x	R	x	x	R	x	R	x
116.XX	x	x		x		x	5	x	x	R	x	R	x	x	R	x	R
117.XX	x	x		x			5	x	x	R	x	R	x	x	R	x	R
118.XX		x	x		x	x	6	R	x	x	R	x	R	x	x	R	x
119.XX		x	x		x		6	R	x	x	R	x	R	x	x	R	x
120.XX			x	x		x	7	R	R	x	x	R	R	R	x	x	R
121.XX			x	x			7	R	R	x	x	R	R	R	x	x	R
122.XX				x	x	x	8	R	R	R	x	x	R	R	R	x	x
123.XX				x	x		8	R	R	R	x	x	R	R	R	x	x
124.XX					x	x	9	R	R	R	R	x	R	R	R	R	x
125.XX					x		9	R	R	R	R	x	R	R	R	R	x
126.XX	x					x	10	x	R	R	R	R	x	R	R	R	R
127.XX	x						10	x	R	R	R	R	x	R	R	R	R
128.XX	x	x				x	11	x	x	R	R	R	x	x	R	R	R
129.XX	x	x					11	x	x	R	R	R	x	x	R	R	R
130.XX	x	x	x			x	12	x	x	x	R	R	x	x	x	R	R
131.XX	x	x	x				12	x	x	x	R	R	x	x	x	x	R
132.XX	x	x	x	x		x	13	x	x	x	x	R	x	x	x	x	R
133.XX	x	x	x	x			13	x	x	x	x	R	x	x	x	x	R
134.XX		x	x	x	x	x	14	R	x	x	x	x	R	x	x	x	x
135.XX		x	x	x	x		14	R	x	x	x	x	R	x	x	x	x

TABLE 2-2. MC CONTROL SWITCHING SYSTEM CONTINUITY PATTERN (cont)

Frequency Control Setting	Pins of J301						Rotary Solenoid Position	Pins of J208					Pins of J203				
	Switch Control					MCAlt.		(Transmitter Test)					(Receiver Test)				
	A	B	C	D	E			F	1	2	3	4	5	1	2	3	4
136.XX			x	x	x	x	15	R	R	x	x	x	R	R	x	x	x
137.XX			x	x	x		15	R	R	x	x	x	R	R	x	x	x
138.XX	x			x	x	x	16	x	R	R	x	x	x	R	R	x	x
139.XX	x			x	x		16	x	R	R	x	x	x	R	R	x	x
140.XX		x			x	x	17	R	x	R	R	x	R	x	R	R	x
141.XX		x			x		17	R	x	R	R	x	R	x	R	R	x
142.XX			x			x	18	R	R	x	R	R	R	R	x	R	R
143.XX			x				18	R	R	x	R	R	R	R	x	R	R
144.XX	x			x		x	19	x	R	R	x	R	x	R	R	x	R
145.XX	x			x			19	x	R	R	x	R	x	R	R	x	R
146.XX	x	x			x	x	20	x	x	R	R	x	x	x	R	R	x
147.XX	x	x			x		20	x	x	R	R	x	x	x	R	R	x

Notes:

1. An "X" in the square beneath a connector pin indicates continuity to ground.
2. An open square beneath a connector pin indicates the circuit is open to ground.
3. An "R" in the square beneath a connector pin indicates 9 ohms resistance to ground in 27.5 vdc unit 5 ohms to ground in 13.75 vdc unit.
4. Rotary solenoids may be hand stepped by rotating back plate to detent limit to step switch one position. Orientation for position 1 is shown in Figure 2-14. Position 2 is next clockwise detent "click", position 3 is next clockwise detent "click", etc.
5. KC control setting has no bearing on these measurements.

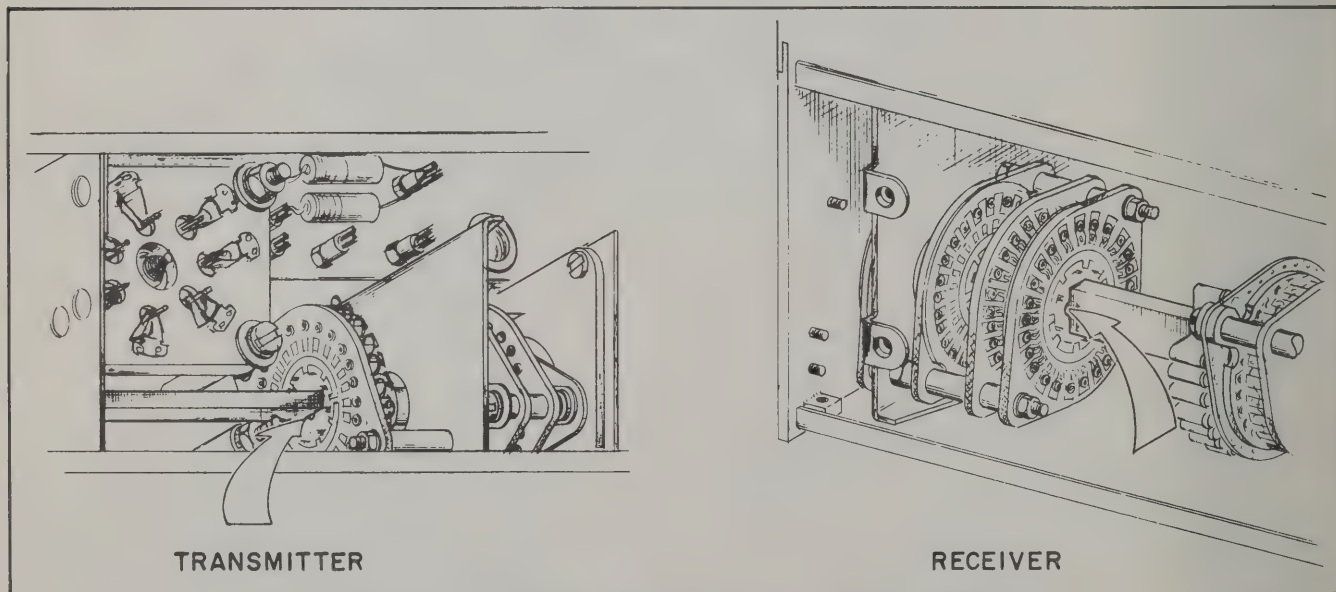


Figure 2-14. Orientation for MC Selector Switch Position 1

f. Auxiliary Equipment Control Switching Circuit

(1) Auxiliary Equipment Control System Operation

A switching arrangement in the control head is provided so that auxiliary equipment used in conjunction with the receiver will be placed in operation when the correct channel for the use of the auxiliary equipment is selected to be received on the LTR-800. The functions the LTR-800 can perform are as follows:

(a) Place navigational equipment on standby when the navigational frequencies (108.00 through 117.90 mc) are selected for operation.

(b) Apply B+ to VOR converter when a VOR channel is selected for reception. Apply B+ to Localizer Converter and Glideslope Receiver when a Glideslope channel is selected for reception.

(c) Switch to communications navigation antenna when a navigational channel is selected.

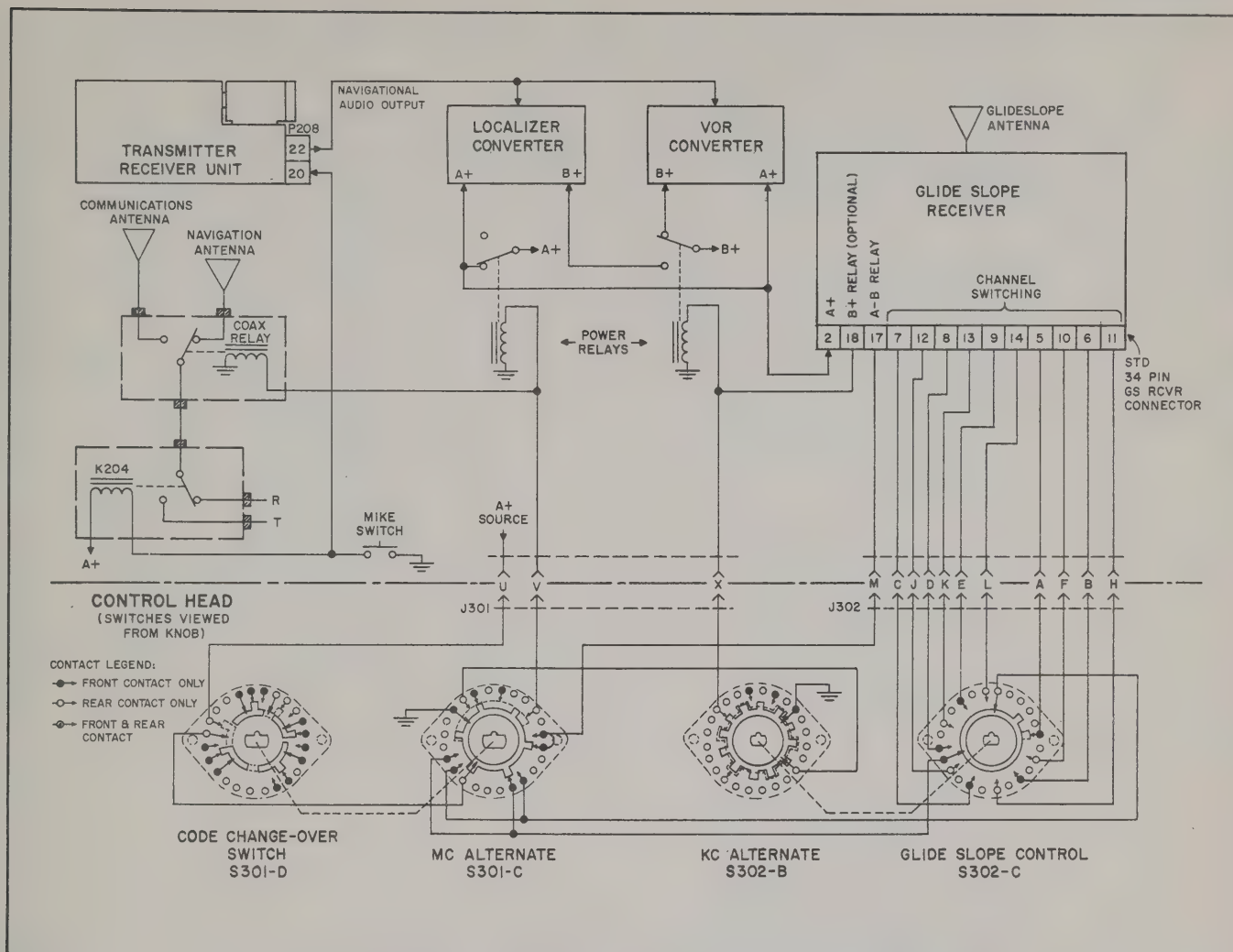


Figure 2-15. Suggested Auxiliary Equipment Control Switching Circuit

(d) Select the correct glideslope receiver channel when its associated localizer frequency is selected for reception.

An LTR-800 may be wired to perform all or part of these functions, depending upon the wishes of the customer and the type of auxiliary equipment used in conjunction with the LTR-800.

Figure 2-15 is a schematic diagram of a communications-navigation system utilizing all of the LTR-800 switching capabilities. Table 2-3, below, gives the functions performed by each of the pins of J302 which are controlled from S301C, S301D, S302B, and S302C.

(2) Explanation of the columns in Table 2-3:

VOR Frequency
(mc/s)

This column gives all presently utilized VOR channels.

Localizer
Frequency (mc/s)

This column gives all presently utilized Localizer frequencies.

Glideslope
Frequency (mc/s)

This column gives all presently utilized glideslope frequencies. Each frequency is always paired with the Localizer frequency alongside which it is listed.

ICAO Sequence
Number

This column gives the International Civil Aviation Organization proposed Glide Path channel number, and the sequence in which the Glide Path frequencies are to be implemented. Although the column is of no present use to U.S. readers, the system of channel numbering may be adopted shortly.

ARINC Glideslope
Channel No.

This column gives the ARINC channel number for all glideslope channels presently in use.

Section II
Paragraph 5

ARINC Relay
Bank No.

This column lists the ARINC relay channel selector bank number for the glideslope frequency given in the third column of the chart. The relay bank is standard in all glideslope receivers made to ARINC specifications.

Pins of J302

An "A" in either of these columns indicates that the pin is connected to the primary A+ supply through pin U of J301.

GS Receiver Con-
nector Pin No.

This column gives the pin number (on a standard Glideslope receiver 34 pin connector) that is grounded to select the channel frequency given in the third column. All glideslope receivers (the Lear LR-89, LGSR-1, Bendix GSA-8, Collins 51V3, and Wilcox 700B) have this frequency selection arrangement.

Pin M of J302 supplies a ground to pin 17 of the standard ARINC glideslope receiver connector, when localizer frequencies are selected on the control head requiring a glideslope receiver frequency selection within the "B" relay bank.

Pins of J301

A+ is applied to pin V for all frequencies under 118 mc. Pin V may therefore be used to operate (1) a relay which connects the navigation antenna to the LTR-800 when energized; (2) connects the communications antenna to the LTR-800 when de-energized.

A+ is applied to pin X when a Localizer frequency is selected on the LTR-800 control head. Pin X may therefore be used to actuate a relay which applies B+ to the glideslope receiver and Localizer converter when energized; applies B+ to the VOR converter when de-energized.

Pins A, B, C, D, E, F, H, J, K, L, provide the ground required to select the glideslope receiver channel for the localizer frequency selected on the LTR-800 control head. The selection is made within the relay bank selected by pin M. The pins of J302 are connected to the following pins on a standard ARINC glideslope receiver connector:

Pins of J302

M	17
A	5
B	6
C	7
D	8
E	9
F	10
H	11
J	12
K	13
L	14

Glideslope Receiver Connector Pin

An "x" in any of these columns indicates that the circuit is closed through the pin to ground.

TABLE 2-3. AUXILIARY EQUIPMENT SWITCHING CONTINUITY PATTERN

ILS FUNCTION

VOR Frequency (mc/s)	Localizer Frequency (mc/s)	Glideslope Frequency (mc/s)	ICAO Sequence Number	ARINC Glideslope Channel No.	ARINC Relay Bank	GS Receiver Connector Pin Number	Pins of J301		Pins of J302														
							V	X	M	A	B	C	D	E	F	H	J	K	L				
108.00	108.10	334.7	11	1	B	5	A																
							A	A	x	x													
108.20	108.30	334.1	12	2	B	6	A																
							A	A	x		x												
108.40	108.50	329.9	13	3	B	7	A																
							A	A	x			x											
108.60	108.70	330.5	14	4	B	8	A																
							A	A					x										
108.80	108.90	329.3	15	5	B	9	A																
							A	A	x														
109.00	109.10	331.4	7	6	A	10	A																
							A	A															
109.20	109.30	332.0	6	7	A	11	A																
							A	A															
109.40	109.50	332.6	3	8	A	12	A																
							A	A															
109.60							A																

TABLE 2-3. AUXILIARY EQUIPMENT SWITCHING CONTINUITY PATTERN (cont)

ILS FUNCTION

VOR Frequency (mc/s)	Localizer Frequency (mc/s)	Glideslope Frequency (mc/s)	ICAO Sequence Number	ARINC Glideslope Channel No.	ARINC Relay Bank	GS Receiver Connector Pin Number	Pins of J301		Pins of J302											
							V	X	M	A	B	C	D	E	F	H	J	K	L	
109.80	109.70	333.2	5	9	A	13	A	A											x	
110.00	109.90	333.8	2	10	A	14	A	A												x
110.20	110.10	334.4	4	1	A	5	A	A			x									
110.40	110.30	335.0	1	2	A	6	A	A				x								
110.60	110.50	329.6	10	3	A	7	A	A					x							
110.80	110.70	330.2	9	4	A	8	A	A						x						
111.00	110.90	330.8	8	5	A	9	A	A							x					
111.20	111.10	331.7	16	6	B	10	A	A	x							x				
111.40	111.30	332.3	17	7	B	11	A	A	x								x			
111.60	111.50	332.9	18	8	B	12	A	A	x									x		
111.80	111.70	333.5	19	9	B	13	A	A	x										x	
112.00	111.90	331.1	20	10	B	14	A	A	x											x
112.20							A	A												
112.40							A	A												
112.60							A	A												
112.80							A	A												
113.00							A	A												
113.20							A	A												
113.40							A	A												
113.60							A	A												
113.80							A	A												
114.00							A	A												
114.20							A	A												
114.40							A	A												
114.60							A	A												
114.80							A	A												
115.00							A	A												
115.20							A	A												
115.40							A	A												

NOT USED

NOT USED

TABLE 2-3. AUXILIARY EQUIPMENT SWITCHING CONTINUITY PATTERN (cont)

ILS FUNCTION

VOR Frequency (mc/s)	Localizer Frequency (mc/s)	Glideslope Frequency (mc/s)	ICAO Sequence Number	ARINC Glideslope Channel No.	ARINC Relay Bank	GS Receiver Connector Pin Number	Pins of J301		Pins of J302																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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6. FREQUENCY GENERATION DATA

a. General

The LTR-800 achieves its extremely large frequency coverage by the multiplication and mixing of frequencies generated by (maximum) 61 crystals in the receiver circuit and 60 crystals in the transmitter circuit.

The multiplication and mixing sequences utilized throughout the equipment are dictated by the need to produce the final frequency desired, while elimi-

nating spurious frequencies and unwanted harmonics.

Table 2-4 and 2-5 (sub-paragraph 6, below) condenses the equipment's frequency generation data into one presentation. It gives all the frequencies generated in the equipment, the crystal used as the primary source, and the rotary solenoid driven switch position required to obtain the frequency. To expedite trouble localization, do not use the table unless referred to it from one of the maintenance procedures in section III of this manual.

b. LTR-800 Frequency Data Chart

Notes:

Refer to Appendix II, parts list, for crystal part numbers and physical locations.

Make all tests of KC frequencies in 108.00 mc range. Operating frequencies of kc crystals remain the same throughout equipment range.

In units having 100 kc channel separation the frequencies for 50 kc steps (xxx.05, xxx.15, xxx.25, etc.) are not derived and K102, K202 are not included.

TABLE 2-4. TRANSMITTER FREQUENCY DATA CHART

Frequency Control Setting	MC Rotary Solenoid Position	K101 Energized (E) De-Ener. (D)	MC Crystal Selected	MC Crystal Freq. (mc/s) Measure at TP3 (8-12 vdc)	V101 Output Freq. (mc/s) Measure at TP4 (20-35 vdc)	KC Rotary Solenoid Position	K102 Energized (E) De-Ener. (D)	KC Crystall Selected	KC Crystal Freq. (mc/s) Measure at TP 2 and V103 Output Freq.	V102 Output Freq.	V105 Output Freq. (and Final Xmitter Freq mc/s)
108.00	1	E	Y101	23.50	47.00	1	D	Y141	14.00	94.00	108.00
108.05	1	E	Y101	23.50	47.00	1	E	Y151	14.05	94.00	108.05
108.10	1	E	Y101	23.50	47.00	2	D	Y142	14.10	94.00	108.10
108.15	1	E	Y101	23.50	47.00	2	E	Y152	14.15	94.00	108.15
108.20	1	E	Y101	23.50	47.00	3	D	Y143	14.20	94.00	108.20
108.25	1	E	Y101	23.50	47.00	3	E	Y153	14.25	94.00	108.25
108.30	1	E	Y101	23.50	47.00	4	D	Y144	14.30	94.00	108.30
108.35	1	E	Y101	23.50	47.00	4	E	Y154	14.35	94.00	108.35
108.40	1	E	Y101	23.50	47.00	5	D	Y145	14.40	94.00	108.40
108.45	1	E	Y101	23.50	47.00	5	E	Y155	14.45	94.00	108.45
108.50	1	E	Y101	23.50	47.00	6	D	Y146	14.50	94.00	108.50
108.55	1	E	Y101	23.50	47.00	6	E	Y156	14.55	94.00	108.55
108.60	1	E	Y101	23.50	47.00	7	D	Y147	14.60	94.00	108.60
108.65	1	E	Y101	23.50	47.00	7	E	Y157	14.65	94.00	108.65
108.70	1	E	Y101	23.50	47.00	8	D	Y148	14.70	94.00	108.70
108.75	1	E	Y101	23.50	47.00	8	E	Y158	14.75	94.00	108.75
108.80	1	E	Y101	23.50	47.00	9	D	Y149	14.80	94.00	108.80
108.85	1	E	Y101	23.50	47.00	9	E	Y159	14.85	94.00	108.85
108.90	1	E	Y101	23.50	47.00	10	D	Y150	14.90	94.00	108.90
108.95	1	E	Y101	23.50	47.00	10	E	Y160	14.95	94.00	108.95
109.00	1	D	Y121	23.75	47.50	1	D	Y141	14.00	95.00	109.00
110.00	2	E	Y102	24.00	48.00	1	D	Y141	14.00	96.00	110.00
111.00	2	D	Y122	24.25	48.50	1	D	Y141	14.00	97.00	111.00
112.00	3	E	Y103	24.50	49.00	1	D	Y141	14.00	98.00	112.00
113.00	3	D	Y123	24.75	49.50	1	D	Y141	14.00	99.00	113.00
114.00	4	E	Y104	25.00	50.00	1	D	Y141	14.00	100.00	114.00
115.00	4	D	Y124	25.25	50.50	1	D	Y141	14.00	101.00	115.00
116.00	5	E	Y105	25.50	51.00	1	D	Y141	14.00	102.00	116.00
117.00	5	D	Y125	25.75	51.50	1	D	Y141	14.00	103.00	117.00
118.00	6	E	Y106	26.00	52.00	1	D	Y141	14.00	104.00	118.00
119.00	6	D	Y126	26.25	52.50	1	D	Y141	14.00	105.00	119.00
120.00	7	E	Y107	26.50	53.00	1	D	Y141	14.00	106.00	120.00
121.00	7	D	Y127	26.75	53.50	1	D	Y141	14.00	107.00	121.00
122.00	8	E	Y108	27.00	54.00	1	D	Y141	14.00	108.00	122.00
123.00	8	D	Y128	27.25	54.50	1	D	Y141	14.00	109.00	123.00
124.00	9	E	Y109	27.50	55.00	1	D	Y141	14.00	110.00	124.00
125.00	9	D	Y129	27.75	55.50	1	D	Y141	14.00	111.00	125.00
126.00	10	E	Y110	28.00	56.00	1	D	Y141	14.00	112.00	126.00
127.00	10	D	Y130	28.25	56.50	1	D	Y141	14.00	113.00	127.00
128.00	11	E	Y111	28.50	57.00	1	D	Y141	14.00	114.00	128.00
129.00	11	D	Y131	28.75	57.50	1	D	Y141	14.00	115.00	129.00

TABLE 2-4. TRANSMITTER FREQUENCY DATA CHART (cont)

Freq. Control Setting	MC Rotary Solenoid Position	K101 Energized(E) De-Ener. (D)	MC Crystal Selected	MC Crystal Freq. (mc/s) Measure at TP3 8-12 vdc)	V101 Output Freq. (mc/s) Measure at TP4 (20-35 vdc)	KC Rotary Solenoid Position	K102 Energized (E) De-Ener. (D)	KC Crystall Selected	KC Crystal Freq. (mc/s) Measure at TP 2 and V103 Output Freq.	V102 Output Freq. (mc/s)	V105 Output Freq. (and Final Xmitter Freq mc/s)
130.00	12	E	Y112	29.00	58.00	1	D	Y141	14.00	116.00	130.00
131.00	12	D	Y132	29.25	58.50	1	D	Y141	14.00	117.00	131.00
132.00	13	E	Y113	29.50	59.00	1	D	Y141	14.00	118.00	132.00
133.00	13	D	Y133	29.75	59.50	1	D	Y141	14.00	119.00	133.00
134.00	14	E	Y114	30.00	60.00	1	D	Y141	14.00	120.00	134.00
135.00	14	D	Y134	30.25	60.50	1	D	Y141	14.00	121.00	135.00
136.00	15	E	Y115	30.50	61.00	1	D	Y141	14.00	122.00	136.00
137.00	15	D	Y135	30.75	61.50	1	D	Y141	14.00	123.00	137.00
138.00	16	E	Y116	31.00	62.00	1	D	Y141	14.00	124.00	138.00
139.00	16	D	Y136	31.25	62.50	1	D	Y141	14.00	125.00	139.00
140.00	17	E	Y117	31.50	63.00	1	D	Y141	14.00	126.00	140.00
141.00	17	D	Y137	31.75	63.50	1	D	Y141	14.00	127.00	141.00
142.00	18	E	Y118	32.00	64.00	1	D	Y141	14.00	128.00	142.00
143.00	18	D	Y138	32.25	64.50	1	D	Y141	14.00	129.00	143.00
144.00	19	E	Y119	32.50	65.00	1	D	Y141	14.00	130.00	144.00
145.00	19	D	Y139	32.75	65.60	1	D	Y141	14.00	131.00	145.00
146.00	20	E	Y120	33.00	66.00	1	D	Y141	14.00	132.00	146.00
147.00	20	D	Y140	33.25	66.50	1	D	Y141	14.00	133.00	147.00

TABLE 2-5. RECEIVER FREQUENCY DATA CHART

Freq. Control Setting and Freq. Rec'd.	MC Rotary Solenoid Position	K201 Ener. (E) De-en. (D)	MC Crystal Selected	MC Crystal Freq. (mc/s)	V203 Output Freq. Measure at TP "A" (5-1.5 vdc)	V202 Output Freq. (mc/s)	KC Rotary Solenoid Position	K202 Ener. (E) De-en. (D)	KC Crystall Selected	KC Crystal Freq. (mc/s) Measure at TP "C" (2-4 vdc)	V205 Output Freq. (mc/s)	Y261 Output Frequency (mc/s) Measure at TP "D" (6-8 vdc)	V207 Output Frequency (mc/s)
108.00	1	E	Y201	48.050	144.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
108.05	1	E	Y201	48.050	144.150	36.100	1	E	Y251	41.900	5.800	6.255	.455
108.10	1	E	Y201	48.050	144.150	36.050	2	D	Y242	41.850	5.800	6.255	.455
108.15	1	E	Y201	48.050	144.150	36.000	2	E	Y252	41.800	5.800	6.255	.455
108.20	1	E	Y201	48.050	144.150	35.950	3	D	Y243	41.750	5.800	6.255	.455
108.25	1	E	Y201	48.050	144.150	35.900	3	E	Y253	41.700	5.800	6.255	.455
108.30	1	E	Y201	48.050	144.150	35.850	4	D	Y244	41.650	5.800	6.255	.455
108.35	1	E	Y201	48.050	144.150	35.800	4	E	Y254	41.600	5.800	6.255	.455
108.40	1	E	Y201	48.050	144.150	35.750	5	D	Y245	41.550	5.800	6.255	.455
108.45	1	E	Y201	48.050	144.150	35.700	5	E	Y255	41.500	5.800	6.255	.455
108.50	1	E	Y201	48.050	144.150	35.650	6	D	Y246	41.450	5.800	6.255	.455

108.55	1	E	Y201	48.050	144.150	35.600	6	E	Y256	41.400	5.800	6.255	.455
108.60	1	E	Y201	48.050	144.150	35.550	7	D	Y247	41.350	5.800	6.255	.455
108.65	1	E	Y201	48.050	144.150	35.500	7	E	Y257	41.300	5.800	6.255	.455
108.70	1	E	Y201	48.050	144.150	35.450	8	D	Y248	41.250	5.800	6.255	.455
108.75	1	E	Y201	48.050	144.150	35.400	8	E	Y258	41.200	5.800	6.255	.455
108.80	1	E	Y201	48.050	144.150	35.350	9	D	Y249	41.150	5.800	6.255	.455
108.85	1	E	Y201	48.050	144.150	35.300	9	E	Y259	41.100	5.800	6.255	.455
108.90	1	E	Y201	48.050	144.150	35.250	10	D	Y250	41.050	5.800	6.255	.455
108.95	1	E	Y201	48.050	144.150	35.200	10	E	Y260	41.000	5.800	6.255	.455
109.00	1	D	Y211	48.383	145.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
110.00	2	E	Y202	48.716	146.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
111.00	2	D	Y222	49.050	147.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
112.00	3	E	Y203	49.383	148.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
113.00	3	D	Y223	49.716	149.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
114.00	4	E	Y204	50.050	150.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
115.00	4	D	Y224	50.383	151.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
116.00	5	E	Y205	50.716	152.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
117.00	5	D	Y225	51.050	153.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
118.00	6	E	Y206	51.383	154.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
119.00	6	D	Y226	51.716	155.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
120.00	7	E	Y207	52.050	156.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
121.00	7	D	Y227	52.383	157.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
122.00	8	E	Y208	52.716	158.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
123.00	8	D	Y228	53.050	159.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
124.00	9	E	Y209	53.383	160.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
125.00	9	D	Y229	53.716	161.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
126.00	10	E	Y210	54.050	162.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
127.00	10	D	Y230	54.383	163.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
128.00	11	E	Y211	54.716	164.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
129.00	11	D	Y231	55.050	165.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
130.00	12	E	Y212	55.383	166.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
131.00	12	D	Y232	55.716	167.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
132.00	13	E	Y213	56.050	168.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
133.00	13	D	Y233	56.383	169.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
134.00	14	E	Y214	56.716	170.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
135.00	14	D	Y234	57.050	171.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
136.00	15	E	Y215	57.383	172.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
137.00	15	D	Y235	57.716	173.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
138.00	16	E	Y216	58.050	174.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
139.00	16	D	Y236	58.383	175.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
140.00	17	E	Y217	58.716	176.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
141.00	17	D	Y237	59.050	177.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
142.00	18	E	Y218	59.383	178.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
143.00	18	D	Y238	59.716	179.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
144.00	19	E	Y219	60.050	180.150	36.150	1	D	Y241	41.950	5.800	6.255	.455
145.00	19	D	Y239	60.383	181.149	36.149	1	D	Y241	41.950	5.801	6.255	.454
146.00	20	E	Y220	60.716	182.148	36.148	1	D	Y241	41.950	5.802	6.255	.453
147.00	20	D	Y240	61.050	183.150	36.150	1	D	Y241	41.950	5.800	6.255	.455

SECTION III
MAINTENANCE PROCEDURES

1. TEST AND MAINTENANCE EQUIPMENT REQUIRED

The following equipment is required for the proper test and maintenance of the LTR - 800 system.

TABLE 3-1. LTR-800 TEST AND MAINTENANCE EQUIPMENT

MANUFACTURER & PART NO. OR MODEL	NAME	DESCRIPTION AND USE
Hewlett Packard 200CD or equivalent.	Audio Oscillator	Capable of 1000 cps output. For modulation and audio stage gain checks.
DuMont 304A or equivalent.	Oscilloscope	Internal sweep plus x and y axis input connectors for general testing.
Hewlett Packard 410B or equivalent.	Vacuum tube Voltmeter (VTVM)	For low level voltage and resistance measurements in alignment and trouble-shooting procedures.
General Radio 583-A or equivalent.	Output Meter	For signal tracing, alignment, and final testing.
General Radio 1001-A or equivalent.	Signal Generator	For signal tracing and i-f alignment capable of 455 kc, 5.8 mc, and 35-37 mc, modulated to 30% with 1000 cps. Variable output attenuator.
Hewlett Packard Model 525B or equivalent*, (see below)	Frequency Counter	For testing frequencies generated throughout the equipment. Capable of measuring 14-150 mc.
*Lampkin type 105-B	Frequency Meter	See frequency counter, above.
Opad-Green GPA 2810 or equivalent.	Power Supply	Capable of 14 vdc at 18 amperes or 28 vdc at 9 amperes (int. current in case of equipment damage).
Lear No. 712850	Dummy Load	For transmitter tests and alignment.
Lear No. 703665	Starting Relay	Part of Bench Test rig (-01 14 volt, -02 28 volt).
Lear No. 712851	Interconnecting cable	Part of Bench Test rig.
Lear No. 706497	Noise Filter	Part of Bench Test rig.
Termaline Model 612	Wattmeter	50 ohm input, 20 watt capacity, 108-150 mc frequency range. For measuring transmitter power output (optional).

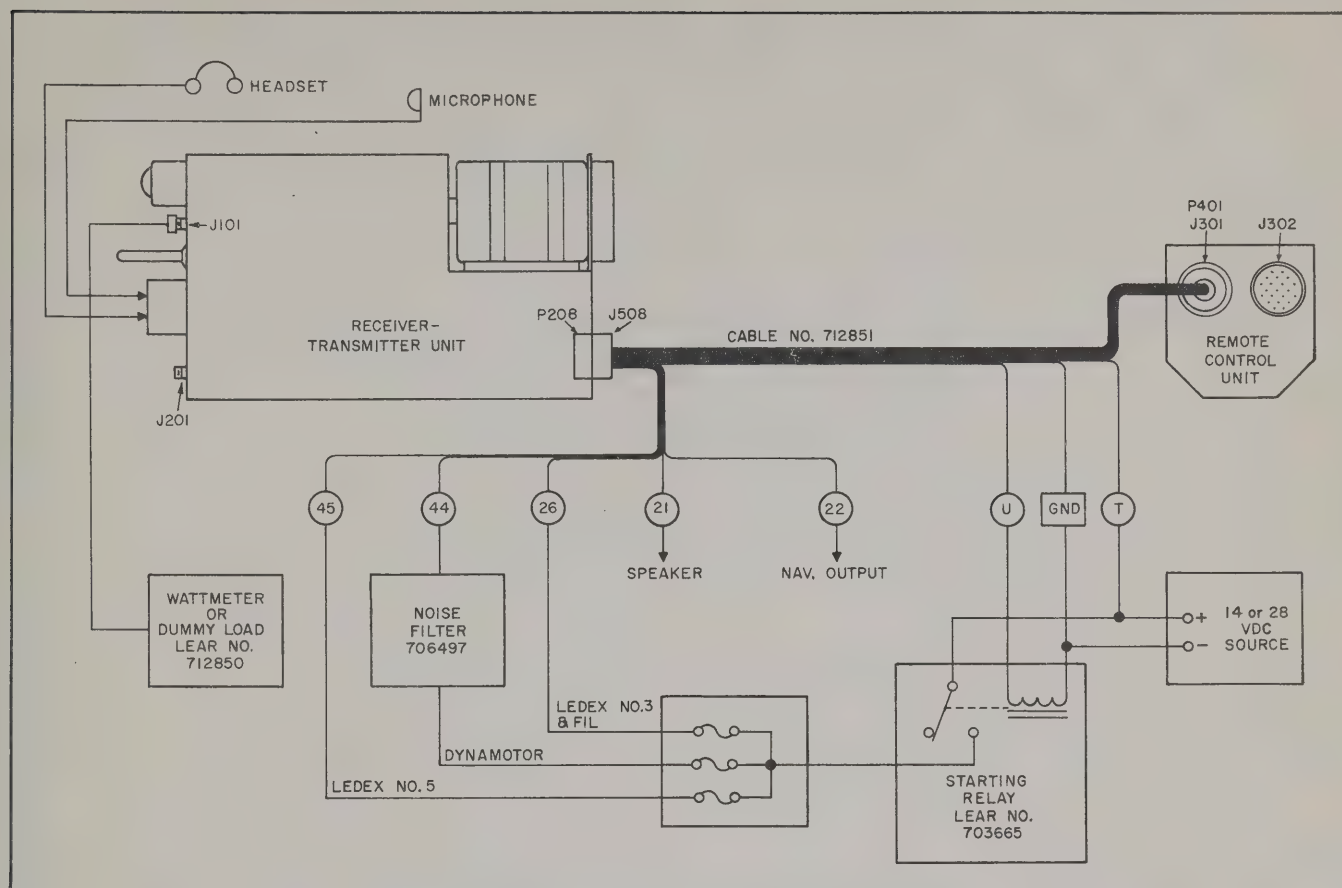


Figure 3-1. LTR-800 Bench Test Connection

2. Trouble Localization Chart

Table 3-2 is a complete guide to trouble localization in the LTR-800. The chart includes symptoms that can be observed when the equipment is operated in the aircraft and symptoms that can be observed when the equipment is bench tested on the ground. For systematic trouble localization, a person unfamiliar with the equipment should follow the trouble localization chart. The various paragraphs of the book having to do with isolation of particular components which have failed are referenced out of the chart as are the test set-ups required to perform the necessary trouble localization test procedures.

For the conclusions as to the cause of trouble to be valid, all preceding checks in the chart must have been made without a trouble symptom being encountered.

3. Etched Circuit Servicing Techniques

Exercise care in soldering etched circuit parts. To avoid subjecting the board to excessive heat, do not use a soldering iron larger than 35 watts.

If too much heat is used, a circuit bond to the base card may be loosened. When this occurs, reconnect the loose line to the cord. If for any reason a line becomes broken, repair by soldering a bare copper wire across the break. Lap the wire 1/4" either side of the break and paint the affected area with clear lacquer after soldering.

The leads of resistors and capacitors have been crimped on the soldered side of the card. To remove one of these components, it is necessary to cut the component lead on the solder side of the card as close to the card as possible, then carefully withdraw the component and the remainder of its lead as the solder is melted.

Use extreme care when soldering or unsoldering CR101. A small amount of the heat will make the diode inoperative. Always use a heat sink (pliers, etc.) when working the leads of the rectifier. Never employ a soldering iron larger than 35 watts.

In the removal of transformers it is necessary to heat each of the leads in rotation, withdrawing them a little at a time. Be extremely careful not to apply excessive heat or pressure.

4. Voltage and Resistance Measurements

Typical voltage and resistance measurements are shown in figures 3-2 and 3-3. These measurements were taken from a random selected LTR-800 which had just passed Factory Quality Control inspection procedures, and therefore met or exceeded all performance specifications. Because the readings were taken on one unit, they should be regarded as being typical only. An LTR-800 can operate satisfactorily when individual readings vary from those shown as much as $\pm 20\%$. However an accrual within the allowable tolerances will usually cause marginal operation of the equipment.

TABLE 3-2. TROUBLE LOCALIZATION CHART

Conditions: Equipment to be wired as follows:

Aircraft Installation - as shown in interconnecting wiring diagram
(Appendix I)

Bench Test - as shown in figure 3-1.

Note: Refer to figure 3-5 for locations of connectors, tubes and test points.

SECTION I. VOLTAGE DISTRIBUTION

Evidence of Correct Operation:

On-off/Volume control turned full clockwise:

Pilot lights on Remote Control Unit light (controllable by dimmer, if used).

Dynamotor operates.

Rotary solenoids operate when either MC or KC channel selectors are rotated.

Test meter on Transmitter-Receiver Unit reads green on A+ position and (with transmitter keyed) on B+ position.

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
1. Pilot lights, dynamotor and rotary solenoids do not operate. No A+ or B+ reading on test meter.	A. No A+ input at J301-T.	a. Check interconnecting wiring and A+ source.	Repair circuit.
2. One pilot light does not light.	A. Open bulb.	a. Check continuity.	Replace bulb.
3. Both pilot lights do not light.	A. Faulty switch.	a. Check continuity: J301-W to J301-P.	If open, replace switch.
	B. Both bulbs open.	a. Check continuity.	Replace bulbs with correct size (see parts list).
4. Dynamotor and rotary solenoids do not operate. No A+ or B+ indication on test meter.	A. Faulty switch.	a. Check continuity: J301-V to J301-T.	If open, replace switch.
	B. Faulty starting relay circuit.	a. Check output side of starting relay for A+ to gnd. b. Check input side of starting relay. c. Check starting relay coil for A+.	If A+ is present, repair wiring to fuse block. If no A+, repair wiring to A+ source. If A+ present, replace relay. If no A+, repair wiring to P301-U.

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
5. Dynamotor does not operate.	A. <u>Dynamotor</u> fuse open.	a. Check for A+ on output side of fuses in fuse block. b. Remove Transmitter-Receiver from dust cover and check the following for a short or low resistance to gnd.: P204-F (Dynamotor), J204-F (Internal), J208-44 (External)	If fuse is blown, perform b. before replacing fuse. Repair short.
	B. Noise filter circuit open.	a. Check input and output of noise filter for A+ to gnd.	If A+ is present, at input but not output, replace filter. If no A+ at input, repair wiring to fuse.
	C. Faulty dynamotor.	a. Remove Transmitter-Receiver from dust cover. Apply correct A+ (14v or 28v) to P204-F and A- to P204-H.	If dynamotor fails to operate, replace or repair dynamotor unit.
	D. Open cabling.	a. Check continuity: J204-F to P208-44 to noise filter output side.	Repair wiring.
6. Rotary solenoid activated by KC knob but not MC knob.	A. <u>Ledex #5</u> fuse open.	a. Check for A+ on output side of fuses in fuse block. b. Remove Transmitter-Receiver from dust cover and check the following for a short or low resistance to gnd.: P206-17 (Receiver) J206-17 (Transmitter) J208-45 (External)	If fuse is blown, perform b. before replacing fuse. Repair short.
	B. Open cabling.	a. Remove Transmitter-Receiver from dust cover and check continuity: J208-45 to fuse. P208-45 to P206-17.	Repair wiring.
7. Transmitter does not key. No A+ or B+ indication on test meter.	A. <u>Ledex #3 and Fil</u> fuse open.	a. Check for A+ on output side of fuses in fuse block. b. Remove Receiver-Transmitter from dust cover and check the following for a short or low resistance to gnd.:	If fuse is blown, perform b. before replacing fuse. Repair short.

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
		P206-15 (Receiver) J206-15 (Transmitter) J208-26 (External)	
	B. Open cabling.	a. Remove Receiver-Transmitter from dust cover and check continuity: J208-26 to fuse P208-26 to P206-15.	Repair wiring.
8. Transmitter does not key. A+ but no B+ indication on test meter.	A. Faulty mike switch.	a. Check continuity: mike plug body to insulated tip.	If open when press-to-talk button depressed, replace mike.
	B. K204 keying relay failure.	a. Check for resistance between J208-20 and J208-26.	If open, check connector wiring and replace K204 if necessary. At the time of relay replacement check spark suppression components (figure 2-8 and 3-8).
	C. Faulty mike jack.	a. Remove test box from receiver and visually inspect jack.	Clean and/or bend contact arm.
9. No B+ indication on test meter.	A. B+ fuse (F201) open.	a. Remove Transmitter-Receiver from dust cover. Fuse located on spark suppression bracket. Check fuse continuity. b. Check the following for a short or low resistance to gnd: output side of fuse J206-16, J206-23, J206-25	If fuse is blown, perform b. before replacing fuse. Repair short.
	B. Bad contact on K204C.	a. Check for B+ at P206-16.	If no B+, check connector wiring and replace K204 if necessary. At the time of relay replacement, check spark suppression components (figures 2-8 and 3-8).
	C. Faulty meter circuit.	a. Check resistance between J206-16 and gnd. (390K) b. Check R134 and S103 switch contacts.	If open, check connector wiring and perform b. if necessary. Replace R134 or repair switch as required.
10. No A+ indication on test meter.	A. Faulty meter circuit.	a. Check resistance between J206-15 and gnd. (20K-14v, 39K-28v).	If open, check connector wiring and perform b.

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
11. No A+ or B+ indication on test meter.		b. Check R135 and S103 switch contacts.	Replace R135 or repair switch as required.
	A. Open meter.	a. Check continuity of meter.	If open, replace meter.
	B. Faulty S103 contacts.	a. Check S103 contacts.	Replace or repair.

SECTION II. TRANSMITTER OPERATION

Before using this section, perform checks outlined in Section I and check that all filaments are on. If any filaments are out, refer to filament circuits on schematic and replace tubes. Remove dust cover from Transmitter-Receiver Unit when trouble-shooting installation in aircraft.

Evidence of Correct Operation:

Press-To-Talk button on mike depressed (Remote Control Unit set to 118.00)

Clean signal with clear modulation audible in headset.

Test meter on Transmitter-Receiver Unit reads at least 2nd major calibration (2) mark on P₀ and PA_G positions and 3rd minor calibration mark (1.5) on MIX_G position.

Note: For errors in channel selection, see text (par. 5 Section III)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
1. Headset dead. No P ₀ , PA _G , or MIX _G indication on test meter.	A. Voltage failure.	a. Perform checks in Section I of this chart.	
2. Headset (only) dead.	A. Faulty headset.	a. Check headset by substitution.	Replace, if necessary.
	B. Faulty headset jack.	a. Remove test bar from Receiver and visually inspect jack.	Clean and/or bend contact arm.
3. Noise but no modulation at headset. No P ₀ , PA _G , or MIX _G indication on test meter.	A. Transmitter not keyed.	a. Depress press-to-talk button.	If transmitter does not key, perform checks in Section I of this chart.
	B. Filaments open.	a. Check transmitter filaments.	Replace tubes or repair as required.
	C. Equipment does not have crystals for frequency selected.	a. Set frequency on Remote Control Unit to 118.00 mc.	
	D. Mixer-Driver failure.	a. Check V104.	Replace, if necessary, and realign (par. 8c. Section III of this manual).

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
		b. If tube OK, make V & R check of V104 (fig. 3-2). c. If voltages and resistances appear normal, proceed to 5.A.c., below.	Repair as required.
4. Noise but no modulation in headset. No P_O , weak P_{AG} , and weak MIX_G indication on test meter.	A. KC frequency generation circuit failure.	a. Short pin 1 of V103 to grid. b. Check V103. c. If tube OK, make V & R check of V103 (fig. 3-2).	If reading drops, proceed to B, below. Repair as required.
5. Noise but no modulation in headset. No P_O , weak P_{AG} , and weak MIX_G indication on test meter.	A. Mixer-Driver stage weak.	a. Check V104. b. If tube OK, make V & R check of V104 (fig. 3-2). c. Align stage (par. 8.c. Section III).	Replace, if necessary, and realign. (See par. 8.c. Section III). Repair as required. If equipment fails to respond to alignment, proceed to B, below.
	B. Weak KC frequency generation stage.	a. Check V103. b. If tube OK, make V & R check of V103 (fig. 3-2).	Replace, if necessary. Repair as required.
	C. Weak MC frequency generation stage.	a. Check V101 and V102. b. If tubes OK, make V & R check of V101 and V102 (fig. 3-2).	Replace, if necessary. Repair as required.
	D. Frequency generation stages need alignment.	a. Align stages (par. 8.c. Section III).	If equipment fails to respond to alignment, proceed to E, below.
	E. KC Switching System failure.	a. Connect frequency counter at TP2. Run a check at all KC knob positions available. Refer to Frequency Conversion Chart (Table 2-4) in Section II. Compare the KC Crystal Frequency column of the chart against the actual frequencies observed on the counter.	If any or all of the frequencies are wrong, trouble-shoot the switching system (par. 5 Section III). If frequencies are wrong on odd KC steps only, trouble-shoot K102 (par. 5 Section III). If only one or two frequencies are wrong,

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
			check the corresponding crystals and switch wafer contacts.
	F. MC Switching System failure.	a. Connect frequency counter at TP3. Run a check at all MC knob positions available. Refer to the Frequency Conversion Chart (Table 2-4) in Section II. Compare the MC Crystal Frequency column of the chart against the actual frequencies observed on the counter.	If any or all of the frequencies are wrong, trouble-shoot the switching system (par. 5 Section III). If frequencies are wrong, on odd MC steps only, trouble-shoot K101 (par. 5 Section III). If only one or two of the frequencies are wrong, check the corresponding crystals and switch wafer contacts.
6. Noise but no modulation in headset. No P_O , and weak (or no) P_{AG} indication on the test meter.	A. Final Power Amplifier failure.	a. Check V105 by substitution. b. If tube OK, make V & R check of V105 (fig. 3-2).	Replace, if necessary, and realign (see par. 8.c. Section III). After replacement, make V & R check of V106 (fig. 3-2) and replace tube or repair if necessary. Repair as required.
7. Noise but no modulation at headset. No P_O indication on test meter.	A. Sidetone detector failure.	a. Check CR101.	Replace, if necessary.
	B. Final Power Amplifier plate voltage lacking.	a. Check resistance: Plates of V105 to J106-16 (800 ohms).	If open, replace R137, T102, L122, or T101 as required. Also check J106-16 wiring.
8. Noise but no modulation at headset.	A. Faulty sidetone circuit.	a. Check for audio at loudspeaker output. b. Rotate sidetone control R287 thru its range. c. Check R137. d. Check K204F contacts.	If no output, proceed to B and C, below. Replace, if necessary. Replace, if necessary. Replace relay, if necessary. At the time of relay replacement check spark suppression components (fig. 2-8 and 3-8).

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
9. Weak (or normal) modulation in headset. Weak P _O , weak (or no) PAG, weak MIXG indication on test meter.	A. Same as 5, above.		
10. Weak (or normal) modulation at headset. Weak P _O and weak (or normal) PAG indication on test meter.	A. Transmitter not loading.	a. Check T-R antenna relay (not part of LTR-800).	Replace or repair as required.
	B. Final Power Amplifier stage weak.	a. Check V105 by substitution. b. If tube OK, make V & R check of V105 (fig. 3-2). c. Align stage (par. 8.c. Section III). d. If equipment fails to respond to alignment, check S101-H for mechanical misalignment (par. 5 Section III).	Replace, if necessary, and realign (par. 8.c. Section III). After replacement, make V & R check of V106 (fig. 3-2) and replace tube or repair if necessary. Repair as required.
11. Weak modulation at headset. Weak P _O indication on test meter.	A. Sidetone detector weak.	a. Check CR101.	Replace, if necessary.
12. Weak and/or distorted modulation at headset.	A. Faulty mike.	a. Substitute mike.	Replace, if necessary.
	B. Modulator stage weak.	a. Check V107.	Replace, if necessary.
	C. C267 bad.	a. Check capacitor.	Replace, if necessary.
	D. Faulty sidetone control R287.	a. Rotate R287 thru range.	Replace, if necessary.
SECTION III. RECEIVER OPERATION Before using this section, perform checks outlined in Section I and check that all filaments are on. If any filaments are out, refer to filament circuit on schematic and replace tubes. (Remove dust cover from Transmitter-Receiver Unit when trouble-shooting installation in aircraft.)			

TABLE 3-2 (Cont)

Evidence of Correct Operation:Remote Control Unit Set to 108.00:

Received signals relatively noise free with clear modulation.
 Very little background noise for no-signal conditions.

Note: For errors in channel selection, see text (par. 5 Section III)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
1. Headset dead.	A. Voltage failure.	a. Perform checks in Section I of this chart.	
	B. Filaments open.	a. Check audio section filaments.	Replace tubes or repair as required.
	C. Faulty headset.	a. Check for noise at navigation output. b. Substitute headset with one known to be good.	If no noise, proceed to D, below. If headset still dead, replace with original headset.
	D. Faulty headset jack.	a. Remove test box from Receiver and visually inspect jack.	Clean and/or bend contact arm.
	E. Second Audio Amplifier circuit failure.	a. Test V213. b. If tube OK, make V & R check of V213 (fig. 3-3). c. If voltages and resistances appear normal, check resistance between headset jack J209 contact arm and gnd. d. Check resistance at T204 pin 6 to gnd. e. Check P205-B and J205-B.	Replace, if necessary. Repair as required. If small resistance, bend up and/or clean headset jack J209 contact arm. If open, replace T204. Repair, if required.
2. Slight background noise but no R-F hash. (On-off/Volume control fully clockwise and squelch control fully counter-clockwise.)	A. Filaments open.	a. Check I-F section filaments.	Replace tubes or repair as required.
	B. Equipment does not have crystals for frequency selected.	a. Set frequency on Remote Control Unit to <u>108.00</u> MC.	
	C. No audio output from Detector.	a. Check for R-F hash at navigation output.	If no hash, proceed to F, below.
	D. Faulty volume control circuit.	a. Momentarily short an .01 (or any convenient size) capacitor between pin 6 of V212 and gnd.	If click is heard, proceed to E, below.

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
		b. Check resistance between J208-19 and J208-18. Rotating volume control R301 thru its range, the resistance should change from 0 to 50K. c. Check volume control R301 for open. d. Check J208-18, P301-S, J301-S, J301-R, P301-R, and J208-18 for broken or shorted connection. e. Check resistance between pin 7 of V213 and P208-19 (10 ohms). f. Check continuity from relay side of R263 to P208-19. g. Check K204-F contacts. h. Check C264.	If OK, perform e. Replace, if required. Repair wiring. If OK, perform h. If OK, replace R263. Replace relay, if necessary. At time of relay replacement check spark suppression components (figures 2-8 and 3-8). Replace, if necessary.
	E. First Audio Amplifier circuit failure.	a. Momentarily short pin 7 of V212 to gnd. b. Test V212. c. If tube OK, make V & R check of V212 (Figure 3-3).	If a loud click is heard, proceed to F, below. Replace, if necessary. Repair as required.
	F. Detector circuit failure.	a. Test V209. b. If tube OK, make V & R check of V103 (Figure 3-3).	Replace, if necessary. Repair as required.
	G. I-F circuit failure.	a. Check V205, V206, V207, and V208.	Replace, if necessary. If OK, proceed to 3.B., below.
3. Low sensitivity or noise output only: <u>ALL CHANNELS</u> (Based on sensitivity test described in par. 6.f. Section III).	A. Filaments open.	a. Check R-F section filaments.	Replace tubes or repair as required.
	B. Low gain thru audio ckts.	a. Make audio stage gain tests (par. 6.b. Section III). b. Test V209, V211, V212 and V213 as required.	If OK, proceed to C, below. Replace, if necessary.

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
		c. If tubes OK, make V & R checks at V209, V211, V212 and V213 (fig. 3-3).	Repair as required.
	C. Low gain or failure thru Third I-F circuits.	a. Make 455KC stage gain tests (par. 6.c. Section III). b. Test V207 and V208. c. If tubes OK, make V & R checks at V207 and V208 (fig. 3-3). d. If voltages and resistances appear normal, align stages (par. 7.c. Section III).	If OK, proceed to D, below. Replace, if necessary. Repair as required.
	D. Low gain or failure thru Second I-F circuits.	a. Make 5.8 mc stage gain tests (par. 6.d. Section III). b. Test V205 and V206. c. If tubes OK, make V & R checks at V205 and V206 (fig. 3-3). d. If voltages and resistances appear normal, align stages (par. 7.d. Section III). e. If equipment fails to respond to alignment, check voltage at TP"D" (6-10 volts d-c). f. Check Y261, C236 and C243.	If OK, proceed to E, below. Replace, if necessary. Repair as required. If OK, proceed to E, below. Repair as required.
	E. Low gain or failure thru First I-F circuits.	a. Make 36.15 - 35.2 mc stage gain tests (par. 6.e. Section III). b. Test V202 and V204. c. If tubes OK, make V & R checks at V202 and V204 (fig. 3-3). d. If voltages and resistances appear normal, align stages (par. 7.e. Section III). e. If equipment fails to respond to alignment,	If OK, proceed to F, below. Replace, if necessary. Repair as required. If all the frequencies are wrong,

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
		connect frequency counter at TP"C". Run a check at all KC knob positions available. Refer to the Frequency Conversion Chart. (Table 2-5) in Section II. Compare the KC Crystal Frequency column of the chart with the actual frequencies observed on the counter.	troubleshoot the switching system (par. 5 Section III). If one or two frequencies are wrong refer to table 2-5 and check individual crystal and selector switch contacts.
	F. Low gain or failure thru R-F input and Osc-Tripler circuits.	a. Make front end test (par. 6.f. Section III). b. Test V201 and V203. c. If tubes OK, make V & R checks at V201 and V203 (figure 3-3). d. If voltages and resistances appear normal, align stages (par. 7.f. Section III). e. If equipment fails to respond to alignment, connect frequency counter at TP"A". Run a check at all MC knob positions available. Refer to the Frequency Conversion Chart (Table 2-5) in Section II. Compare the V203 Output Frequency column of the chart with the actual frequencies observed on the counter.	Replace, if necessary. Repair as required. If any or all the frequencies are wrong, troubleshoot the switching system (par. 5 Section III).
4. Low sensitivity or noise output only: <u>A FEW CHANNELS ONLY.</u> (Based on sensitivity test described in par. 6.f. Section III).	A. Switching system failure.	a. Connect frequency counter at TP"C". Run a check at all "bad" channel knob positions. Refer to Frequency Conversion Chart (Table 2-5) in Section II. Compare the KC Crystal Frequency column of the chart with the actual frequencies observed on the counter.	If frequencies are wrong, troubleshoot the switching system (par. 5 Section III).
		b. Connect frequency counter at TP"A". Run a check at all "bad" channel knob positions. Refer to the Frequency Conversion Chart (Table 2-5) in Section II. Compare the V203 Output	If frequencies are wrong, troubleshoot the switching system (par. 5 Section III). If only one or two frequencies are wrong, check the corresponding

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
		Frequency column of the chart with the actual frequencies observed on the counter.	crystals and switch wafer contacts.
5. Low sensitivity or noise output only: <u>ODD KC CHANNELS ONLY</u> (Based on sensitivity test described in par. 6.f. Section III).	A. K202 failure.		Troubleshoot the switching system (par. 5 Section III).
6. Low sensitivity on noise output only: <u>ODD MC CHANNELS ONLY</u> (Based on sensitivity test described in par. 6.f. Section III).	A. K201 failure.		Troubleshoot the switching system (par 5 Section III).
7. Normal sensitivity but excessive RF hash.	A. Noise limiter circuit failure.	a. Test V211. b. If tube OK, make V & R check at V211 (fig. 3-3).	Replace, if necessary. Repair as required.
8. Squelch inoperative.	A. Squelch Amplifier circuit failure.	a. Test V212. b. If tube OK, make V & R check at V212 (fig. 3-3).	Replace, if necessary. Repair as required.
9. Navigational output weak or dead.	A. Navigational Output Amplifier circuit failure.	a. Test V213. b. If tube OK, make V & R check at V213 (fig. 3-3). c. If voltages and resistances appear normal, check external cabling.	Replace, if necessary. Repair as required. Repair wiring.
10. AGC inoperative.	A. AGC circuit failure.	a. Test V209. b. If tube OK, make V & R check of V209 (fig. 3-3). c. If voltages and resistances appear normal, check all AGC line resistors and capacitors, and continuity at pin 6 of J202 and P202.	Replace, if necessary. Repair as required.

TABLE 3-2 (Cont)

EVERYTHING OK EXCEPT:	PROBABLE CAUSE	TEST	ACTION
11. No loudspeaker output.	A. Model does not have provision for loud-speaker.	a. Refer to par. 4.b. Section I and check name-plate.	
	B. Faulty speaker.	a. Check by substitution.	Replace speaker, if necessary.
	C. Faulty T102 secondary winding.	a. Check resistance between T102 pin 6 (Transmitter) and gnd.	If open, replace T102.
	D. Faulty wiring.	a. Check pins 20 and 21 of J106 and P206.	Repair, as required.
		b. Check external wiring.	Repair wiring.
	E. Modulator not activated on RECEIVE position of relay K204.	a. Check plate and screen voltage at V107 (pins 6 and 8 and pin 7). Refer to fig. 3-3. b. Check K204-B contacts. c. Check K202-A contacts. d. Check resistance of R131 (8.2K)	If no voltage at 6 and 8, perform b. If no voltage at 7, perform c. If OK, proceed to F, below. If open, replace K204. At time of relay replacement check spark suppression components (figures 2-8 and 3-8). Replace, if necessary.
	F. Output from 2nd Audio Amplifier not reaching Modulator.	a. Check K204-E contacts. b. Check C276.	If open, replace K204. At time of relay replacement check spark suppression components (figures 2-8 and 3-8). Replace, if necessary.

Conditions under which the measurements were taken are shown in the figures.

WARNING

300 volts is used in the transmitter. BE CAREFUL when taking measurements. Use one hand only when measuring voltages in equipment. Do not service alone. Remember that abnormally high voltages may exist at unsuspected points because of equipment failure.

5. Frequency Selector Switch System Trouble Localization Procedures

This procedure is included to give a positive, step-by-step method by which trouble can be localized in the frequency selector switching system. Before using the procedure, it should be definitely determined that the trouble actually is in the switching system by performing the tests in the Trouble Localization Chart (Table 3-2) or through some other method that is equally valid. Refer to theory paragraph 5 before using this procedure.

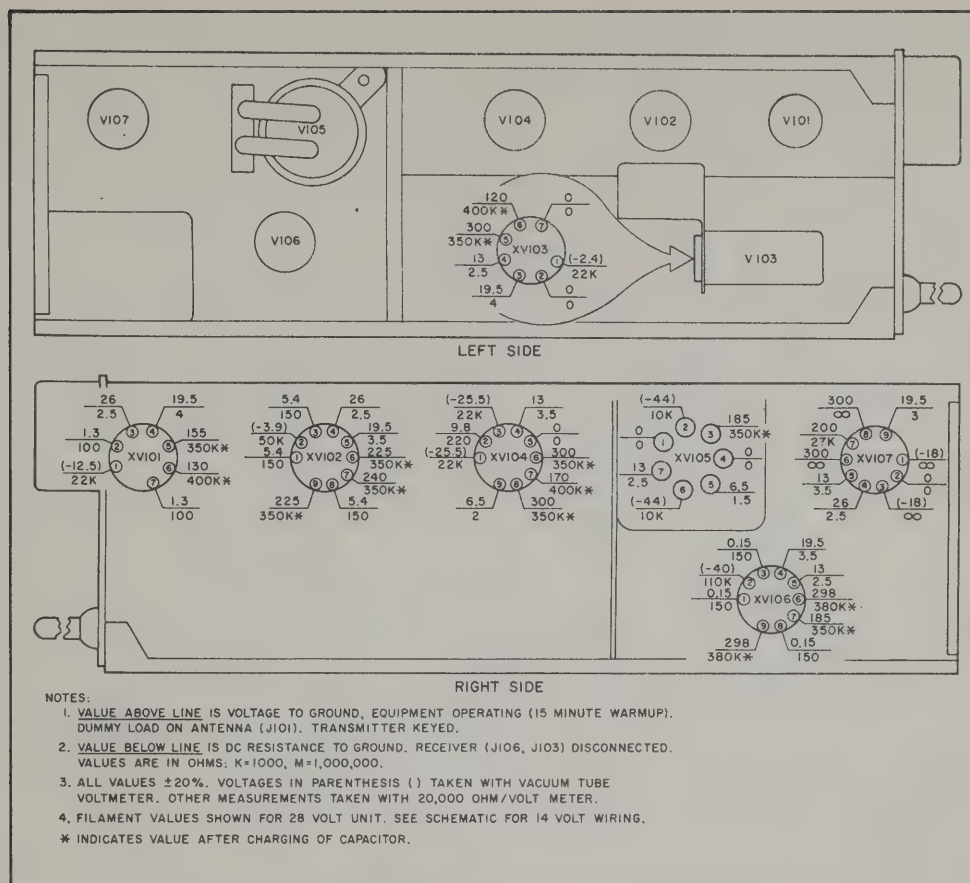


Figure 3-2. Transmitter Unit Voltages and Resistances

a. Common Failures:

(1) Mechanical Jamming

Mechanical jamming of a Rotary Solenoid driven switch is evidenced by a buzzing sound, which stops only when the frequency control is set at one particular mc or kc frequency. Upon examining the buzzing rotary solenoid, it will be seen that the solenoid "half-steps" continuously but does not change the position of the driven switch. (A constantly rotating switch is a symptom of another kind of failure.) To correct this type of failure, remove the rotary solenoid and check its detent mechanism by turning the back plate of the relay by hand. The mechanism will step easily, or a great deal of difficulty will be experienced getting the relay to step past a certain position. If the relay hand steps OK, check the driven switch for misalignment caused by bent sheet metal bulkheads, or for jamming caused by bent contacts on the switches. Sometimes a customer will leave the equipment on with the frequency control set in a position that causes half-stepping for several hours. In this case, the relay will be burned out.

(2) Open Contacts in the Driven Switches (not in the rotary solenoid homing wafer)

In tuned stages that are not crystal controlled, low output (other than that caused by component de-

rating) that cannot be improved by realignment will be caused by switches that have dirty, worn, or bent contacts. To localize this type of trouble follow the instructions in the Trouble Localization Chart (Table 3-2) to find out which switch wafer may be causing the trouble, and on which switch positions trouble is being encountered. Refer to Theory paragraphs 5d and 5e which give the switch positions and orientation instructions for determining those positions. Make continuity checks through the contacts involved. The resistance measurements should be taken on the lowest voltmeter scale available (readable to within .1 ohm) and should show continuity.

b. MC Selector Switch Failures

(1) MC ALTERNATE SELECTOR FAILURE

(a) This failure is evidenced by the transmitter and/or the receiver operating properly on odd mc frequencies, but operating improperly on even mc frequencies or vice versa. For example, the transmitter will transmit 119.XX mc, but when the frequency selector knob is turned to 118.XX mc the transmitter will continue to transmit 119.XX mc. Similarly, the receiver would receive 109.XX mc and 111.XX mc, but not operate when the frequency selector is set at 108.XX mc, or 110.XX mc. In some instances (when the relay contacts are burned out) the equipment will not operate at any frequency. The trouble must be localized to K101 in the trans-

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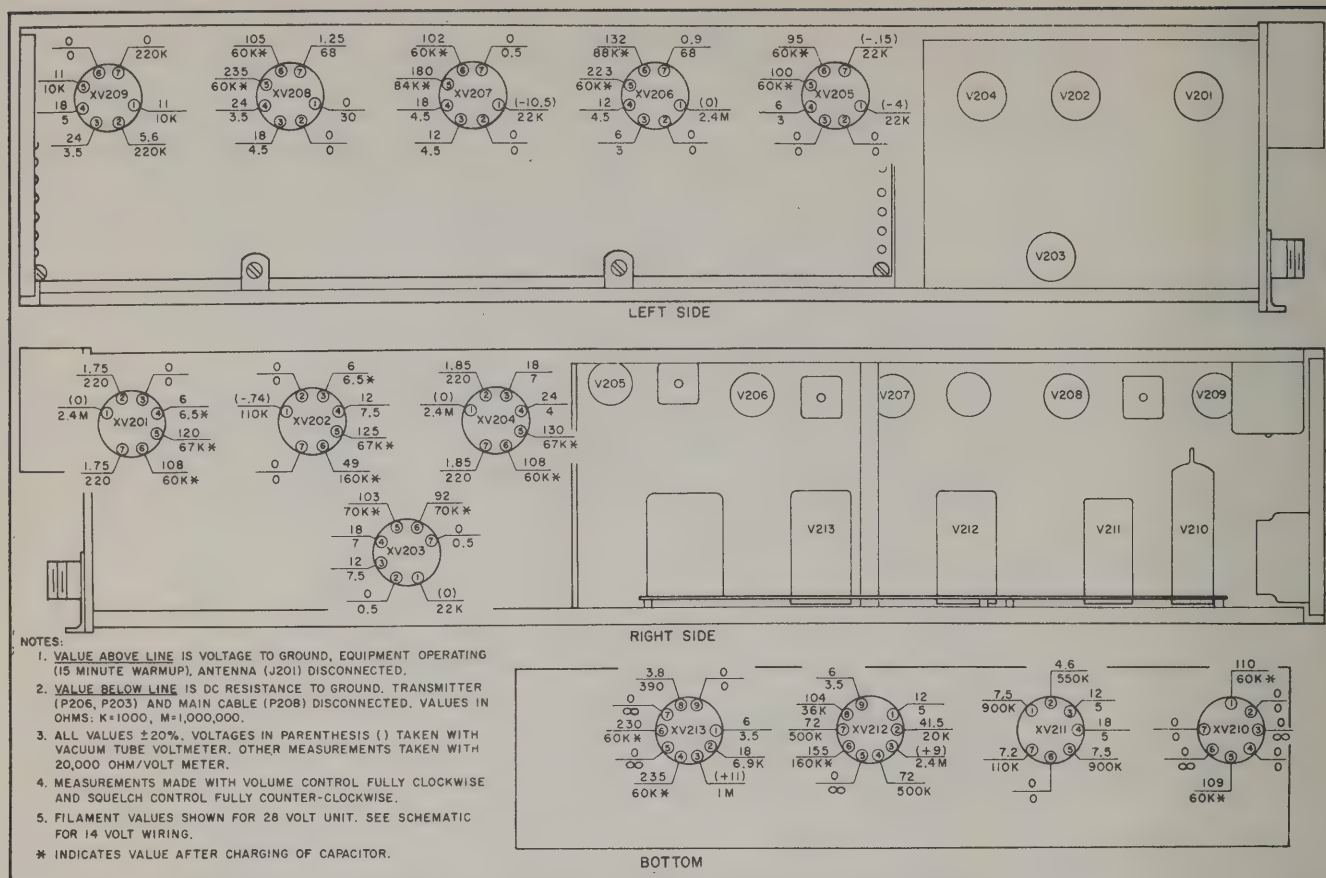


Figure 3-3. Receiver Unit Voltages and Resistances

mitter, K201 in the receiver, or in MC Alternate control wafer S301C, located in the control head. To localize the trouble, proceed as follows:

(b) Disconnect P203 and J103.

(c) Locate K101 in the transmitter unit (Figure 3-15). Turn the frequency selector knob on the control head from 118.XX mc to 119.XX mc. You should be able to hear K101 click. If the relay does not click, check the resistance through the relay by disconnecting the lead at relay pin 4 then measure the resistance between pin 4 and ground. On 28 volt units this resistance must be 500 ohms. On 14 volt units, the resistance must be 200 ohms. If the resistance is too high, check for an open in the ground lead connected from S301C to pin 2 of the relay (see Figure 2-13), or for an open in the relay coil. If the resistance is too low, check for a short in the relay coil. If necessary, replace the relay.

In checking the ground circuit of the relay, the ohmmeter must show continuity to ground on the even mc readings of the MC selector knob (108.XX, 110.XX, etc.) and an open on the odd mc reading throughout the complete frequency range of the equipment.

(d) Reconnect P203 and locate K201 (Figure 3-11).

(e) Turn the frequency control from 108.XX mc to 109.XX mc. You should be able to hear the relay

click. If the relay does not click, check the resistance through the relay by disconnecting the lead at relay pin 4 then measuring the resistance between pin 4 and ground. On 28 volt units the resistance must be 500 ohms. On 14 volt units, the resistance must be 200 ohms. If the resistance is too high, check for an open in the ground lead connected from S301C to pin 2 of the relay (see Figure 2-13), or for an open in the relay coil. If the resistance is too low, check for a short in the relay coil. If necessary, replace the relay.

In checking the ground circuit of the relay, the ohmmeter must show continuity to ground on the even mc readings of the MC selector knob (108.XX, 110.XX, etc.) and an open on the odd mc reading, throughout the complete frequency range of the equipment.

(f) If both relays operate, check their contact resistance across pins 3 and 5 in the de-energized condition, and across pins 1 and 3 in the energized condition.

(2) MC ROTARY SOLENOID CONTROL SYSTEM FAILURE

(a) This failure is usually evidenced by random frequency errors occurring when a comparison is made between tables 2-4, 2-5 and frequency counter readings at TP"4" in the transmitter or TP"A" in the receiver. The trouble is also evidenced by constant 360° cycling of the transmitter and/or re-

ceiver MC rotary solenoid, or failure of either (or both) solenoids to rotate when the position of the frequency selector knob is changed. To correct this type of failure, the trouble must be localized to Transmitter mc rotary solenoid L124, Receiver rotary solenoid L227, or wafers S301A, B, and D which control the operation of the transceiver rotary solenoids from the control head.

(b) Operate the equipment at a few test frequencies, connecting the frequency counter at TP3 in the Transmitter and TP"A" in the receiver, to discover whether the transmitter, the receiver, or both, are indexing incorrectly. This check is made by comparing the actual frequencies obtained at the control head settings with the frequencies that are supposed to be obtained listed in tables 2-4 and 2-5, paragraph 6b of the Theory section. (This step need not be performed if a rotary solenoid is running continuously, or if a rotary solenoid does not run.)

(c) If the receiver alone is not indexing properly, the transmitter rotary solenoid and the control wafers in the control head are okay. Disconnect P203 and J103 and reconnect it at receiver connector J203. If the receiver then indexes properly, the trouble is in S101J which is the control wafer for the receiver solenoid. If the receiver does not index properly, the rotary solenoid should be hand-indexed to position 1 (Figure 2-14) and a step-by-step continuity check made of the homing wafer following the chart in paragraph 5e of the Theory section. If the continuity pattern does not match that in the table, repair its homing wafer or replace the rotary solenoid.

(d) If both the receiver and the transmitter index improperly, the trouble is in either the transmitter homing wafer, or the control head. Disconnect P203 from J103 and reconnect it at receiver connector J203. If the receiver now indexes correctly, the trouble is in the transmitter rotary solenoid homing wafer. Hand index the transmitter mc switch to position 1 (Figure 2-14) and make a step-by-step continuity check utilizing the table in paragraph 5e of the Theory section. If the continuity pattern does not match that in the table, replace the rotary solenoid or repair its homing wafer.

(e) If the receiver indexes incorrectly, after making the test in step (d), the trouble is in the control head. Refer to paragraph 5e and make a continuity check of all positions of the mc control on the control head. Refer to Figure 2-13 in the theory section for a detailed schematic diagram of the control head mc control circuit, and trace the trouble from the pins where the continuity does not check out, to the switch wafer which has failed.

c. KC Selector Switch Failures

(1) KC ALTERNATE SELECTOR FAILURE

(a) This failure is evidenced by the transmitter and/or the receiver operating properly on even kc selections (.10, .20, .30 etc.) but operating improperly on odd kc selections (.15, .25, .35 etc.). The opposite can also occur. To localize the trouble, proceed as follows:

(b) Refer to figure 3-16 to locate K102, or figure 3-9 to locate K202.

(c) When the frequency is changed from an even to an odd kc value, these relays should click audibly (listen closely).

(d) If one of the relays fails to click, measure across its coil to ground. For K102, this value is 500 ohms in 27.5 vdc units, or 200 ohms in 27.5 vdc units, or 130 ohms in 27.5 vdc units.

(e) If the coil resistance of one of the relays does not check out, replace the relay.

(f) If the coil resistance checks out o.k., measure through the relay contacts with an ohmmeter that will read .1 ohm. The contact resistance shall be zero ohms. If the contact resistance is higher, replace the relay.

(g) If the relays check out o.k., check the control circuit by measuring between pin F of J301 and ground. The ohmmeter must show continuity to ground on .05 mc set steps and an open on .10 mc steps throughout the full range of the KC selector knob.

(2) KC ROTARY SOLENOID CONTROL SYSTEM FAILURE

(a) This failure is usually evidenced by random frequency errors occurring when a comparison is made between tables 2-4 and 2-5 and frequency counter readings at TP2 in the transmitter and/or TP"C" in the receiver. The trouble is also evidenced by constant 360° cycling of one or both KC rotary solenoids or by failure of either/or both solenoids to rotate when the KC frequency control knob is turned.

(b) Operate the equipment at a few test KC frequencies (e.g. 108.10, 108.20, 108.90) with the frequency counter connected at TP2 in the transmitter, and then TP"C" in the receiver.

(c) If the receiver alone is not indexing correctly, disconnect P203 from J103, and reconnect it at J203. Repeat the tests performed in (a) above. If the receiver now indexes correctly, the trouble is in S102B, the control wafer operated by the rotary solenoid in the transmitter, which, in turn, controls the receiver KC switch position. If the receiver does not index correctly when connected directly to the control head output, the trouble is in L228 or its homing wafer S202C. Make a test of the solenoid from position 1 following the chart in paragraph 5d of the Theory section. If necessary, remove the rotary solenoid for test, repair, or replacement.

(d) If both the receiver and the transmitter index incorrectly, the trouble is either in the transmitter homing wafer or the control head. Disconnect P203 from J103 and reconnect it at J203. If the receiver now indexes correctly, the trouble is in L112 or its homing wafer S102A. Hand index the solenoid to position 1 (Figure 2-12) and make a step-by-step continuity check utilizing the table in paragraph 5d

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of the Theory section. If the continuity pattern does not match that given in the table remove the solenoid and its homing wafer for test, repair or replacement.

(e) If the receiver indexes incorrectly in the test in step (d) the trouble is in the control head. Refer to the table in paragraph 5d of the Theory section and make a continuity check of control head KC control circuit wafer S302A. Use the simplified schematic Figure 2-11 to trace the wiring from J301 to the wafer contact causing the failure.

d. Auxilliary Equipment Control System Trouble Localization

Failure of the LTR-800 to control the auxilliary equipment (VOR converter, Localizer Converter, and Glideslope receiver) will be due either to failure in the LTR-800 control head, in the relays (not part of the LTR-800) actuated from the control head which, in turn, actuate the various auxilliary equipment itself. The best method of localizing trouble in this system is to refer to table in paragraph 5f of the Theory section and check out the control head to make certain that the trouble is not being generated here. Should the trouble be caused by the control head, the simplified schematic (Figure 2-15) should be referred to for isolation of the cause to a particular switch wafer. If the control head continuity for the auxilliary control circuit checks out okay, the trouble must be localized by testing the relays used to switch the auxilliary equipment and the auxilliary equipment itself.

6. RECEIVER SIGNAL TRACING PROCEDURES

a. General

At times, certain obscure troubles occurring in the LTR-800 receiver will require signal tracing procedures to be followed for their localization.

Signal tracing is the process of injecting a signal of known amplitude, frequency, and waveshape into a circuit and observing, by means of a suitable instrument, the effect upon the signal by the circuit. When the complete circuit consists of many stages, the signal tracing procedure is begun at the output of the equipment with the signal being injected at the input of the final stage. The output may be observed with an output meter, an oscilloscope, or both. The injected signal is then connected to a succession of input points, moving from the output to the input stage. At each point the signal must be adjusted to be as nearly equivalent as possible to the signal normally existing at that point in the circuit. The information displayed on the output monitoring instrument must indicate that the circuitry between the output and the injected signal is functioning normally. When a point is reached where the injected signal disappears, or produces a distorted output, a stage containing abnormal conditions has been located and detail trouble isolation procedures are begun.

Signal tracing of the receiver is to be carried out with the control head connected, the transmitter removed, and the equipment connected to the correct value primary voltage source.

b. Receiver Audio Output Stage Gain Test

(1) TEST EQUIPMENT CONNECTION

Connect the equipment as shown in figure 3-4A.

Audio Oscillator. Connect as instructed below, 1000 cps output.

(2) LTR-800 SET-UP

Receiver on and tuned to 108.00 mc. SQUELCH control (R286) full counter-clockwise (squelch off). VOL control full clockwise.

(3) TEST RESULTS

The listed output for each of the following audio inputs:

- (a) 8 volts at pin 6, V213 for .1 mw output.
- (b) 1 volt at pin 7, V213 for 20 mw output.
- (c) 0.5 volt at pin 7, V212 for 100 mw output.
- (d) 1.5 volts at pin 2, V209 for 100 mw output.

c. Receiver Third I-F Stage Gain Test

(1) TEST EQUIPMENT CONNECTION

Connect equipment as shown in figure 3-4A.

Signal Generator. 455kc output, modulated 30% with 1000 cps. Connect at the points indicated below.

(2) LTR-800 SET-UP

As in b (2), above.

(3) TEST RESULTS

The listed output for each of the following inputs:

- (a) 90 mv at pin 1 of V208 for 5 mw output.
- (b) 75 mv at pin 5 of V207 for .5 mw output.
- (c) 50 mv at pin 7 of V207 for 5 mw output.

d. Receiver SECOND I-F Stage Gain Test

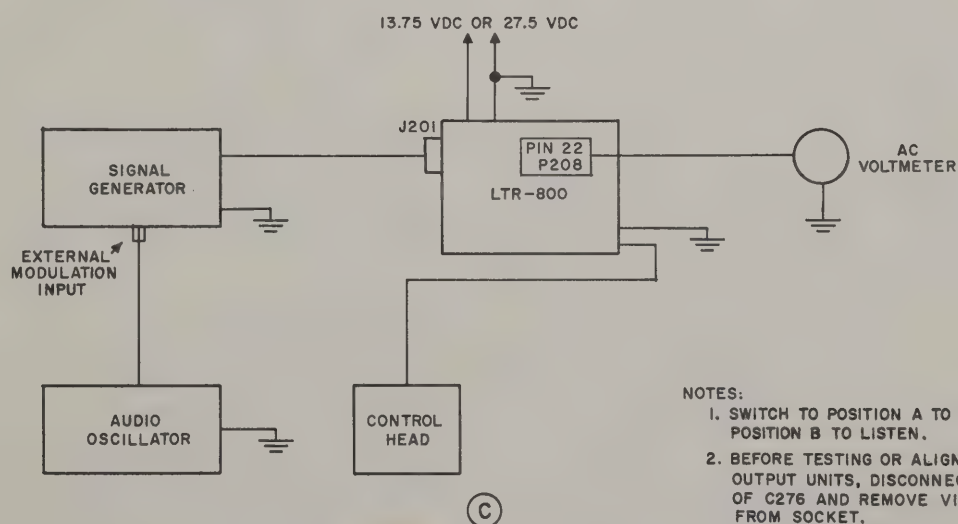
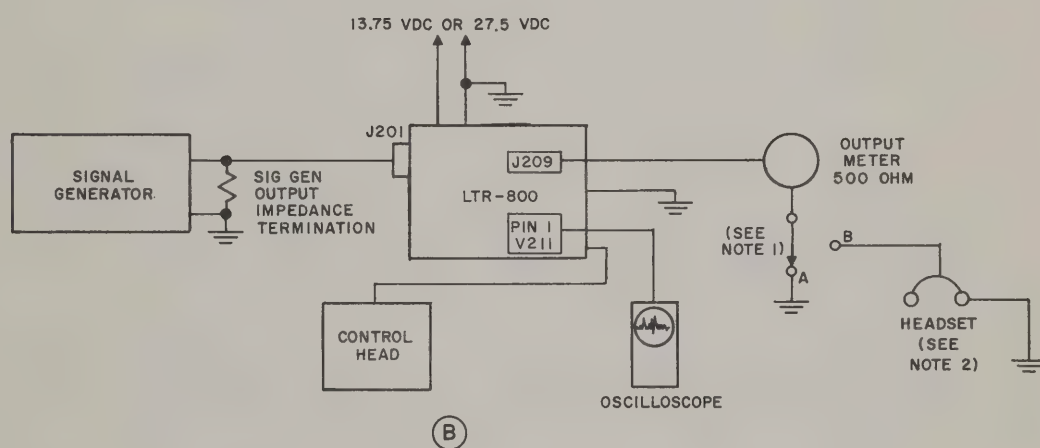
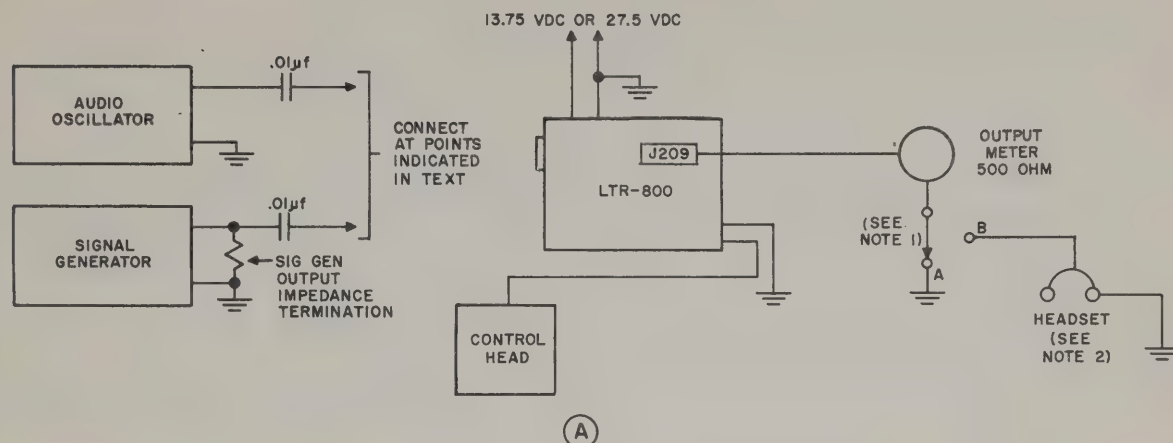
(1) TEST EQUIPMENT CONNECTION

Connect equipment as shown in figure 3-4A.

Signal Generator. Connect as instructed below. 5.8 mc output, modulated 30% with 1000 cps.

(2) LTR-800 SET-UP

As in b(2), above.



- NOTES:
1. SWITCH TO POSITION A TO MEASURE,
POSITION B TO LISTEN.
 2. BEFORE TESTING OR ALIGNING SPEAKER
OUTPUT UNITS, DISCONNECT ONE END
OF C276 AND REMOVE V107 (TRANSMITTER)
FROM SOCKET.

Figure 3-4. Receiver Unit Alignment and Test Connections

(3) TEST RESULTS

100 milliwatts output for each of the following inputs:

- (a) 1500 uv at pin 1 of V206.
- (b) 450 uv at pin 7 of V205.

e. Receiver FIRST I-F Stage Gain Test

(1) TEST EQUIPMENT CONNECTION

Connect the equipment as shown in figure 3-4A.

Signal Generator. 36.150 mc output modulated 30% with 1000 cps. Connect at the points indicated below.

(2) LTR-800 SET-UP

As in b(2), above.

(3) TEST RESULTS

50 milliwatts output for each of the following inputs:

- (a) 1500 uv at pin 1 of V204.
- (b) 100 uv at pin 5 of V201.

f. RF Stage Gain Test

(1) TEST EQUIPMENT CONNECTION

Connect the equipment as shown in figure 3-4B. The oscilloscope is not required.

Signal Generator. Connected at J201. Output modulated 30% with 1000 cps at the frequencies indicated below.

(2) LTR-800 SET-UP

As in b(2), above.

(3) TEST RESULTS

No more than 3 uv input shall be required to obtain 100 milliwatts output on each of the frequencies for which the receiver is equipped with crystals. The tests should be made at 108.00 mc, through 108.90 (or 108.95 mc) to test the operation of Y201 and the KC crystals. The remainder of the available channels should be checked at the mc value, .00 kc.

Signal-to-noise ratio of the equipment may be checked by turning off the signal generator modulation (only) and watching for a drop of 6db, or more, on the output meter.

g. Noise Limiter Test

(1) TEST EQUIPMENT CONNECTION

Connect the equipment as shown in figure 3-3B.

Signal Generator. Any frequency near the low end of the equipment band, unmodulated. 2 uv output amplitude.

Oscilloscope. Internal sweep adjusted to 1000 cps.

(2) LTR-800 SET-UP

As in b(2), above, tuned to input signal.

(3) TEST RESULTS

Slowly increase the signal generator modulation, observing the waveform on the oscilloscope. As the percentage of modulation approaches 50%, the noise limiter should start clipping off the peaks of the waveform.

h. Squelch Circuit Test

The squelch circuit is tested as part of the squelch adjustment procedure given in paragraph 7g of this section.

7. Receiver Alignment Procedure

a. General

Alignment of the LTR-800 receiver should be undertaken only under the following conditions:

- (1) When trouble shooting definitely indicates the necessity for alignment (Table 3-2.)
- (2) When adding new channels.

b. Alignment Connections and Control Settings

Fig. 3-4 shows the connections required for the alignment of the receiver unit, figure 3-5 the alignment and test points called out in the test. Unless otherwise specified, the LTR-800 controls shall be set as follows for alignment:

VOL control: full clockwise

MC control: highest odd megacycle channel for which receiver has crystals

KC control: .00

SQUELCH control: lowest threshold (full counter-clockwise)

c. Receiver 455 KC I-F Alignment

(1) EQUIPMENT SET-UP

Connect the equipment as shown in figure 3-4A.

(2) Inject a 455 kc signal modulated 30% at 1000 cps at the control grid (pin 1) of V208. Set the signal generator output level at a point just high enough to obtain the lowest readable indication on the output meter.

(3) Adjust T203 for a peak reading on the output meter. Adjust the primary first, then the secondary. Alternately peak the two inductances until an absolute peak is obtained on the output meter. Always adjust the secondary last. After each peak is reached, reduce the output of the signal generator to the point where a just-legible indication is obtained on the output meter. This will prevent activation of the receiver AGC circuit.

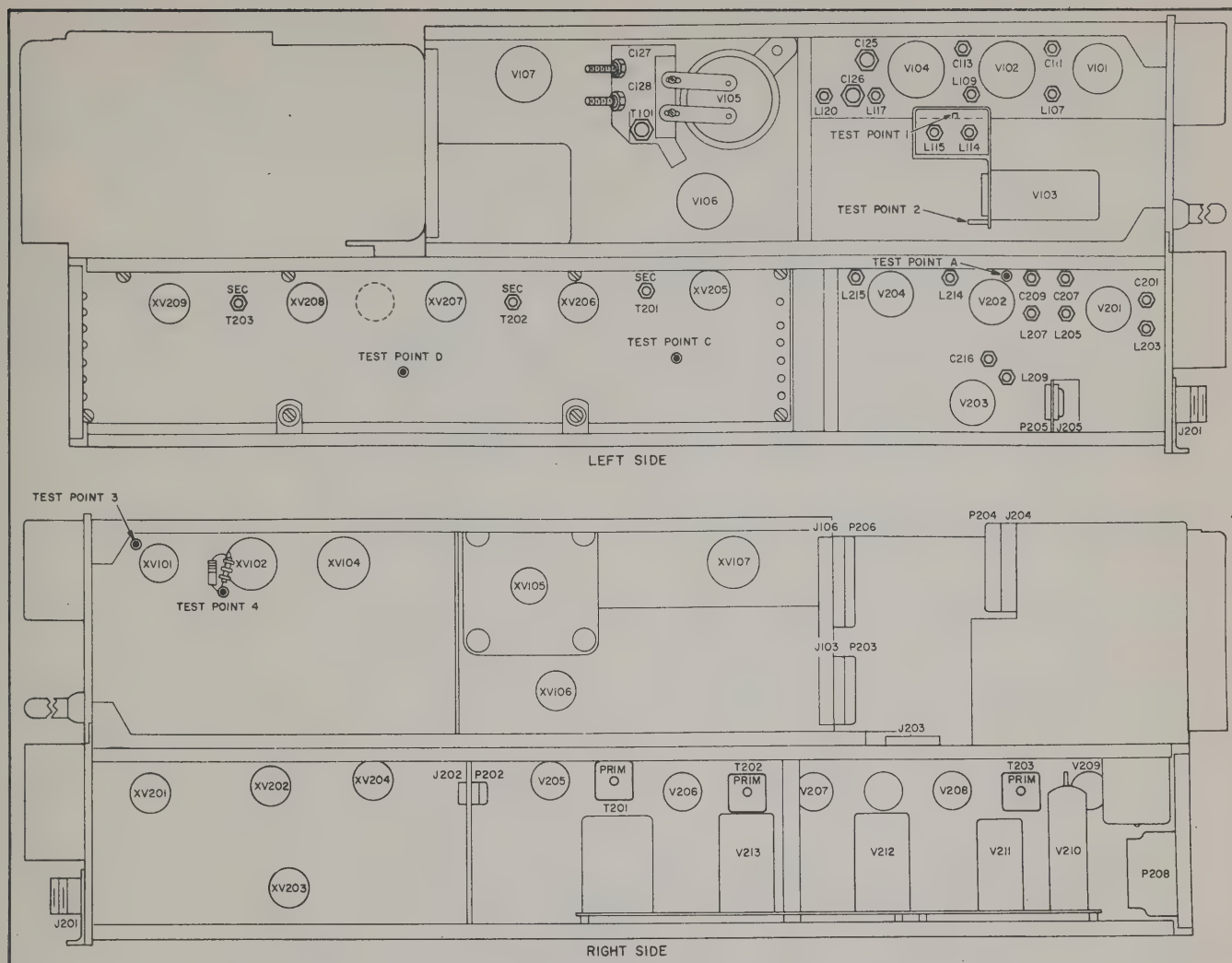


Figure 3-5. LTR-800 Test and Alignment Points

d. Receiver 5.8 MC I-F Alignment

(1) EQUIPMENT SET-UP

Connect the equipment as shown in figure 3-4A.

(2) Inject a 5.8 mc signal modulated 30% at 1000 cps at the grid (pin 7) of V205. Obtain 5.8 mc by tuning the signal generator for a peak reading of the output meter. Set the signal generator output level to obtain the lowest readable indication on the output meter.

(3) Adjust in this order: T202 primary, T202 secondary, T201 primary, T201 secondary to obtain a peak reading on the output meter. Reduce the signal generator output level after each adjustment to obtain the lowest legible reading on the output meter.

(4) Continue adjustment of the 5.8 mc interstage transformers, making each adjustment in its proper order, until no higher peak can be achieved.

e. Mixer, First I-F Plate Tuning

(1) EQUIPMENT SET-UP

Connect the equipment as shown in figure 3-4A.

(2) Inject a 35.65 mc signal modulated 30% at 1000 cps at the control grid (pin 1) of V202. Obtain 35.65 mc by adjusting the signal generator for a peak reading on the output meter. Set the signal generator output level to obtain the lowest readable indication on the output meter.

(3) Adjust (first) L215 (second) L214 to obtain a peak reading on the output meter. Continue adjustments until no higher peak can be obtained. After each adjustment reduce the signal generator output level to obtain the lowest legible reading possible on the output meter.

f. Tuner Section Alignment

(1) EQUIPMENT SET-UP

Connect the equipment as shown in fig. 3-4B. The oscilloscope is not required. Connect a tuning shunt, consisting of a 270 ohm 1/4 watt resistor in series with a .001 uf 200 volt capacitor, across C207 (Fig. 3-11).

(2) Inject a 109.00 mc signal modulated 30% at 1000 cps and set the LTR-800 frequency controls at this

Section III

Paragraphs 7 to 8

frequency. If the LTR-800 being aligned does not have 109.00 mc as its lowest (odd) receiving channel, inject a signal at the equipment's lowest available odd mc, (.00) channel. Set the signal generator output just high enough to obtain a legible reading on the output meter.

(3) Adjust C209 and C216 for a peak reading on the output meter. Decrease the signal generator input level after each adjustment to the point that gives the lowest legible reading on the output meter. Repeat the adjustments to obtain the highest peak possible.

(4) Retune the signal generator to give the highest odd mc frequency (.00) for which the receiver has crystals.

(5) Peak L207 and L209 using the same procedure used in the adjustment of C209 and C216.

(6) Repeat steps (2), (3), (4) and (5) until no further adjustment is possible. Always complete the adjustment procedure with L207 and L209.

(7) Remove the tuning shunt from across C207 and connect it across C209. (Fig. 3-11).

(8) Peak C201 and C207 at the lowest odd mc (.00) frequency available in the receiver. Decrease signal generator input after each adjustment.

(9) Peak L203 and L205 at the highest odd mc (.00) frequency available in the receiver.

(10) Repeat steps (8) and (9) until no further peaking can be achieved. Make the last adjustment on L203 and L205.

(11) Remove the tuning shunt.

g. Squelch Adjustment

(1) EQUIPMENT SET-UP

Connect the equipment as shown in fig. 3-4B. The output meter is not required.

(2) Inject a 2 uv signal modulated 30% at 1000 cps. The frequency of the signal should be at the center frequency of the receiver's complete frequency coverage.

(3) Turn the Squelch Control potentiometer slowly until the signal cuts out, then return it to the exact point where the signal cuts in.

(4) Squelch threshold is, in part, a matter of customer preference. The squelch on the LTR-800 can be set at any level up to 25 uv. However, the 2 uv setting is recommended.

8. TRANSMITTER ALIGNMENT

a. General

Align the transmitter only when adding new channels or when trouble shooting definitely shows alignment is required.

b. Alignment Connections and Control Settings

Figure 3-6 shows the connection required for alignment of the transmitter unit and figure 3-5 shows the alignment and test points called out in the text.

c. Procedure

(1) EQUIPMENT SET-UP

Connect the equipment as shown in fig. 3-6A.

(2) Turn meter switch S103 to MIX_G and the frequency selector knob to XXX.80 (the mc selector position has no bearing on this procedure).

(3) Adjust, in this order, L114 and L115 for a peak reading on M101.

(4) Set the transmitter frequency controls at 119.00 mc or at the lowest odd (.00) mc frequency for which the transmitter has an available crystal.

(5) Connect the VTVM at TP4 (dc voltage scale). Key the transmitter and adjust C111 for a peak reading on the meter.

(6) Disconnect the VTVM and turn S103 to the MIX_G position.

(7) Adjust C113 for a peak reading on meter M101.

(8) Turn S103 to the PA_G position.

(9) First adjust C125 for a peak reading on M101. Then adjust C126 for a peak reading on M101.

(10) Turn S103 to P_O position.

(11) Adjust C127 and C128 so that their slugs are nearly all the way in, and protrude an equal distance from the capacitor body.

(12) Readjust C127 and C128 for a peak reading on M101. Adjust the capacitors alternately so that the peak is achieved with both slugs protruding an equal distance from the capacitor body.

(13) Repeat steps 5-12 until no further peaking is possible. Readjust C127 and C128 so that the highest possible peak is achieved with the slugs of both capacitors protruding equal distances from the capacitor body.

(14) Set the frequency selector at the highest odd mc (.00) frequency for which the equipment has crystals.

(15) Connect the VTVM at TP4 (dc voltage scale) and adjust L107 for a peak reading on the meter.

(16) Disconnect the VTVM and turn S103 to the MIX_G position.

(17) Adjust L109 for a peak reading on meter M101.

(18) Turn S103 to the PA_G position.

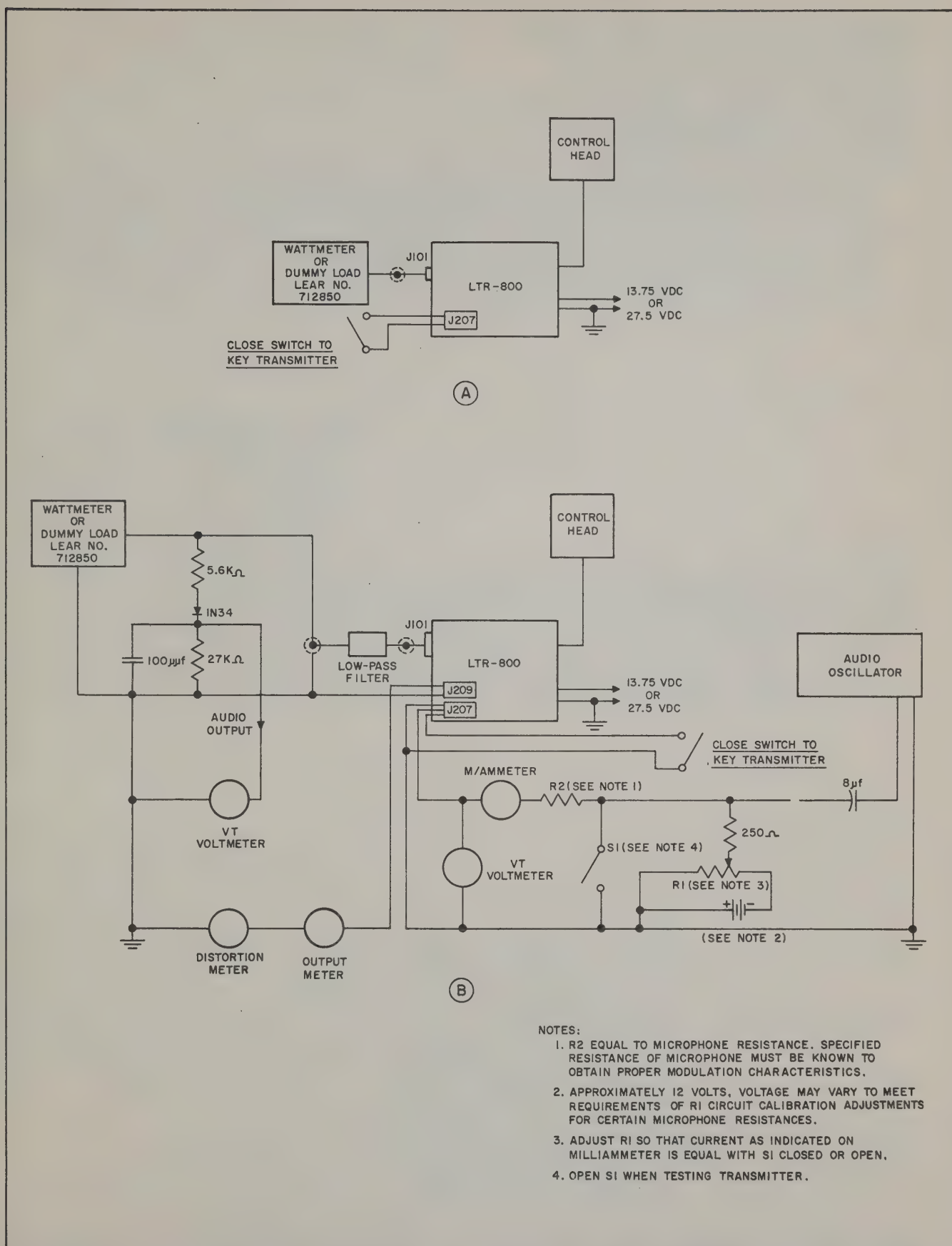


Figure 3-6. Transmitter Unit Alignment and Test Connections

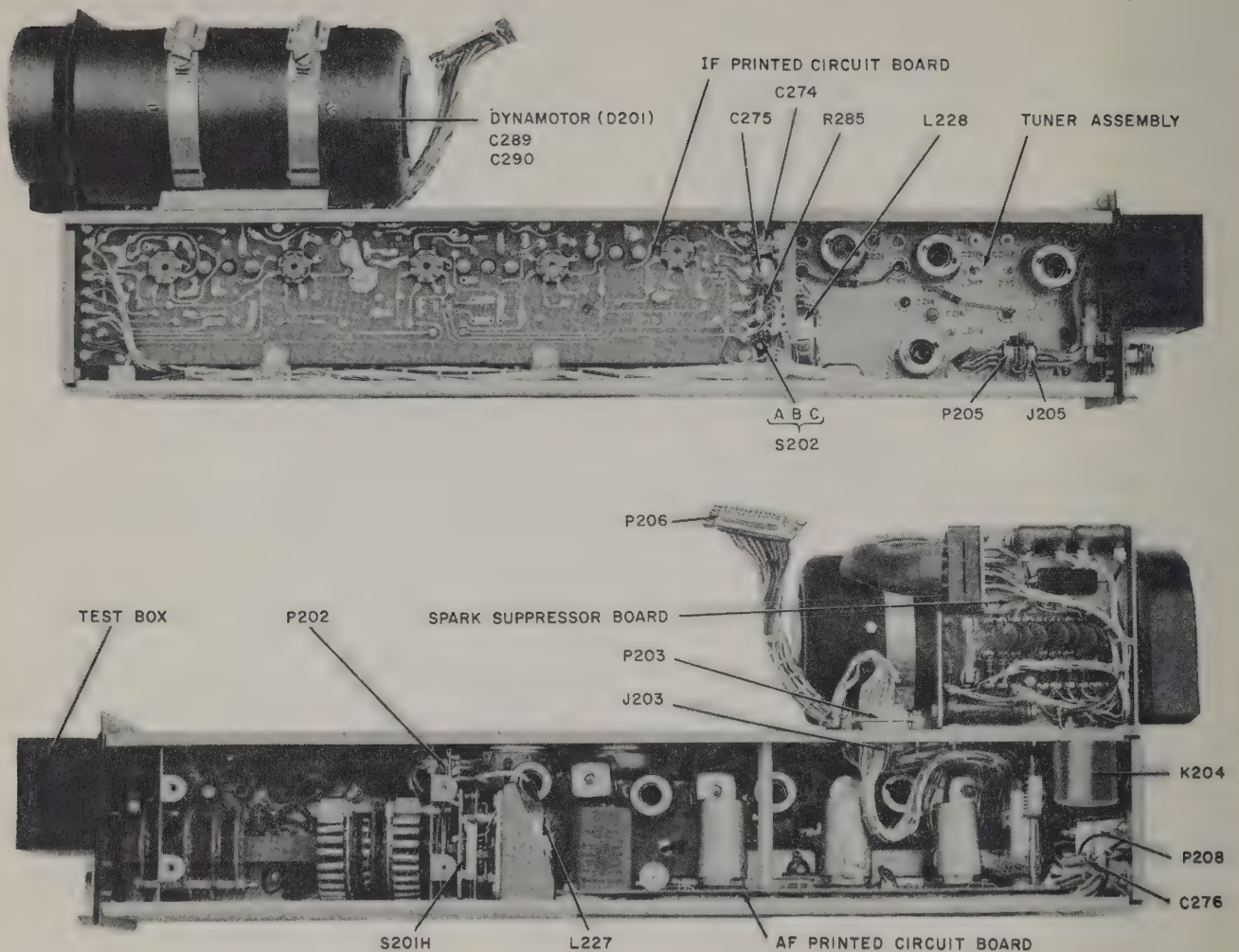


Figure 3-7. Receiver Unit

- (19) Adjust L117 for a peak reading on M101.
- (20) Turn S103 to the P_O position.
- (21) Adjust, in this order, L120 and T101 for a peak reading on M101.
- (22) Repeat steps 15-21 until no further peaking is possible.
- (23) Check tuning of L109 at the high end of the transmitter band-spread (odd mc .00) and C113 at the low end using the MIX_G position of S103.
- (24) Turn S103 to the P_O position and retune C127 and C128 for balance. Use the lowest odd (.00) available transmitter setting of the frequency selector. Make the adjustment by detuning one capacitor slightly and retuning the other to obtain a higher peak than was previously obtained.
- (25) Return the frequency selector to the highest available transmitter odd mc (.00) frequency and recheck the tuning of T101.

9. FINAL TESTING

The tests outlined below reveal the salient performance characteristics of the equipment and will indicate whether or not an LTR-800 is operating to its original specifications. The tests should be performed after the equipment has been repaired, or as a regular part of preventive maintenance. To begin testing, connect the equipment to a source of A+ power (13.75 volts or 27.5 volts, with equipment operating). Unless otherwise stated in the paragraphs below, the control head need not be set, volume control is at maximum (full clockwise) and squelch control is inoperative (full counter-clockwise). Upon completing the tests, adjust the squelch control as instructed in paragraph 7g of this section.

a. System Tests

(1) POWER REQUIREMENT

- (a) Connect an ammeter between A+ input (located at pin 44 on P208) and ground.
- (b) Disconnect receiver from transmitter at P203 and P206.

(c) With receiver operating alone, function switch in REC, current drawn shall not exceed 4.0 ± 0.5 amperes with 27.5 volt input or 8.0 ± 1 amperes with 13.75 volt input.

(d) Reconnect P203 and P206.

(e) With receiver and transmitter connected current drawn shall be 5.5 ± 0.5 amperes with 27.5 volt input or 11.0 ± 1 amperes with 13.75 volt input.

(f) With receiver and transmitter connected and transmitter keyed current drawn shall be 8.5 ± 0.5 amperes with 27.5 volt input or 17.0 ± 1 amperes with 13.75 volt input.

(2) TEST HIGH VOLTAGE

(a) Connect voltmeter between pin B of P204 and ground.

(b) Voltage shall be 325 - 350 (max) vdc.

b. Receiver Tests

(1) TEST I-F SENSITIVITY

(a) Connect equipment as shown in Figure 3-4A. With signal generator inject 35.65 mc at pin 7 of V205, modulated 30% at 1000 cps.

(b) Input level required to obtain 100 milliwatts output shall be 450 microvolts (max).

(c) Inject 5.8 mc signal at pin 1 of V206.

(d) Input level required to obtain 100 milliwatts output shall be 350 microvolts (max).

(2) TEST OVERALL SENSITIVITY AND SIGNAL TO NOISE RATIO

(a) Connect equipment as shown in Figure 3-4B. Plug output meter into headset jack J209 in receiver test box. Turn control head selector through all fre-

quencies for which crystals are installed. Set signal generator to frequency selected at the control head, output modulated 30% with 1000 cps.

(b) The rated sensitivity of the LTR-800 is 3 microvolts to produce 100 milliwatts. The rated signal - noise ratio is $-6\text{db} \frac{\text{signal} + \text{noise}}{\text{noise}}$. To check these ratings for each frequency selected, follow the procedure described in c, d and e below.

(c) Run the signal generator output level up to the point where the output meter reads 100 milliwatts. The Signal Generator output shall be 3 microvolts or less. This checks the sensitivity.

(d) Turn off the signal generator modulation only. The output shall drop 6db or more. This checks the signal-noise ratio.

(e) Repeat the procedure (c and d) at each frequency. The sensitivity and $\frac{\text{signal} + \text{noise}}{\text{noise}}$ ratio shall meet the rating of sub-paragraph (b) for each frequency.

(3) TEST OVERALL SELECTIVITY

(a) Allow the equipment to remain connected as in Test (2). Input level to produce 100 milliwatts output. Select any frequency on the control head for which a crystal is installed.

(b) Vary the Signal Generator 15 KC (min) each side of the frequency selected at the control head.

(c) There shall be a maximum of -6db attenuation of the audio output signal as indicated on the output meter, 15 KC each side of the selected frequency.

(d) Vary the signal generator 55 KC (max) each side of the frequency selected at the control head.

(e) There shall be a minimum of -80db attenuation of the audio output signal as indicated on the output meter, 55 KC each side of the selected frequency.

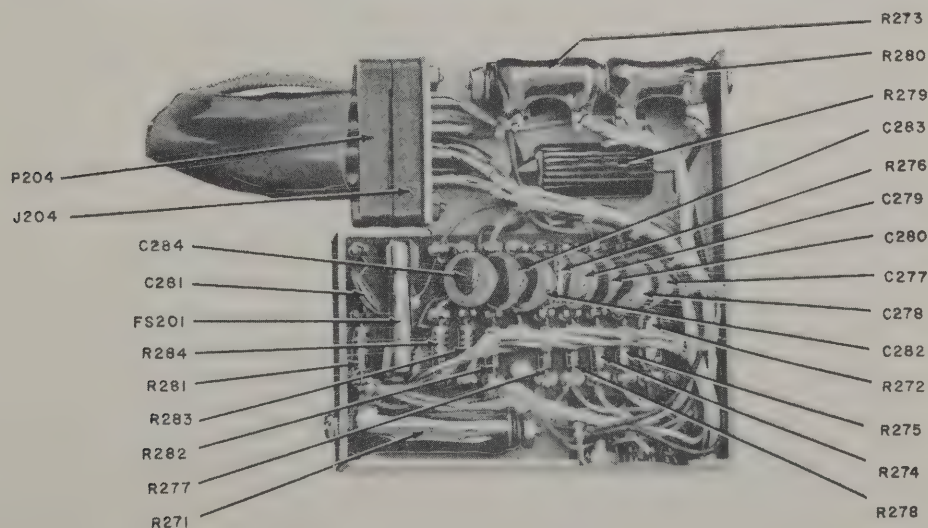


Figure 3-8. Spark Suppression Bracket

(4) TEST AUTOMATIC GAIN CONTROL

(a) Allow the equipment to remain connected as in Test 2.

(b) Adjust manual volume control to obtain that condition wherein varying the input level over the range from 10 microvolts to 0.2 volts produces a maximum output equal to 100 milliwatts.

(c) With the manual volume control fixed, the audio output shall not vary more than 5db over the input range of 10 microvolts through 0.2 volts.

(5) TEST LOUDSPEAKER OUTPUT (For Loudspeaker operation only)

(a) Connect the output meter to pin 21 of P208. Otherwise allow the equipment to remain connected as in Test (4). Select any frequency on the control head for which a crystal is installed. Set signal generator to frequency selected on the control head, output modulated 30% at 1000 cps.

(b) Input level required to obtain 2 watts output into a 3.1 ohm load shall be 2.5 microvolts.

(6) TEST VOR AND ILS OUTPUT

(a) Connect the equipment as shown in figure 3-4C.

(b) Select 108.00 mc on the frequency control head and set the signal generator to deliver this output at a 10 microvolt carrier level.

(c) Use the audio oscillator to modulate the signal generator output enough to establish a reference level of 1 volt on the VTVM.

(d) Without changing the amplitude of the audio oscillator output signal, vary its frequency between 30 and 10,000 cps.

(e) The output from the LTR-800, as indicated on the VTVM, shall not vary more than ± 10 db.

c. Transmitter Tests

(1) TEST CARRIER POWER OUTPUT

(a) Connect wattmeter to antenna connector J101 with the low pass filter (FL101) installed in output.

(b) Output power shall be 5 watts (min) into a 50 ohm load.

(2) TEST MODULATION CAPABILITY

(a) Connect equipment as shown in figure 3-6B. Set audio oscillator for 1000 cps at a level of 1 volt.

(b) Determine the modulation percentage of the carrier from the AC and DC voltage at the output of the linear rectifier using the formula:

$$\text{Percentage Modulation} = \frac{\text{Peak AC Voltage} \times 100}{\text{DC Voltage}}$$

(c) Repeat the procedure (a and b) using an input level of 1.5 volts.

(d) The modulation percentage shall be 85% over the input voltage range from 1 volt to 1.5 volts.

(3) TEST AUDIO FREQUENCY DISTORTION

(a) Allow the equipment to remain connected as in Test 2. Set input level to 1 volt with 85% modulation at 1000 cps.

(b) With the input level and modulation held constant, vary the audio oscillator frequency over the range 300-3500 cps.

(c) The percent of distortion in the demodulated output of the linear detector indicated on distortion meter shall not exceed 20% over the frequency range of 300-3500 cps.

(4) TEST CARRIER NOISE LEVEL

(a) Allow the equipment to remain connected and adjusted as in Test 3.

(b) Note the demodulated signal plus noise output on the distortion meter.

(c) Remove the audio input signal and again note the demodulated noise output on the distortion meter.

(d) The noise level produced in procedure (c) shall be at least 40 db below that produced in procedure (b).

(5) SIDETONE TEST AND ADJUSTMENT (For headset operation only)

(a) Allow the equipment to remain connected and the audio oscillator adjusted as in Test 4. Plug wattmeter into headset jack (J209 in receiver test box). Adjust sidetone control R287 in receiver test box for 50 milliwatts output.

(b) With the audio input level and modulation held constant, vary the audio oscillator frequency over the range 300-3500 cps.

(c) The sidetone output level shall not vary more than 6db over the frequency range 300-3500 cps.

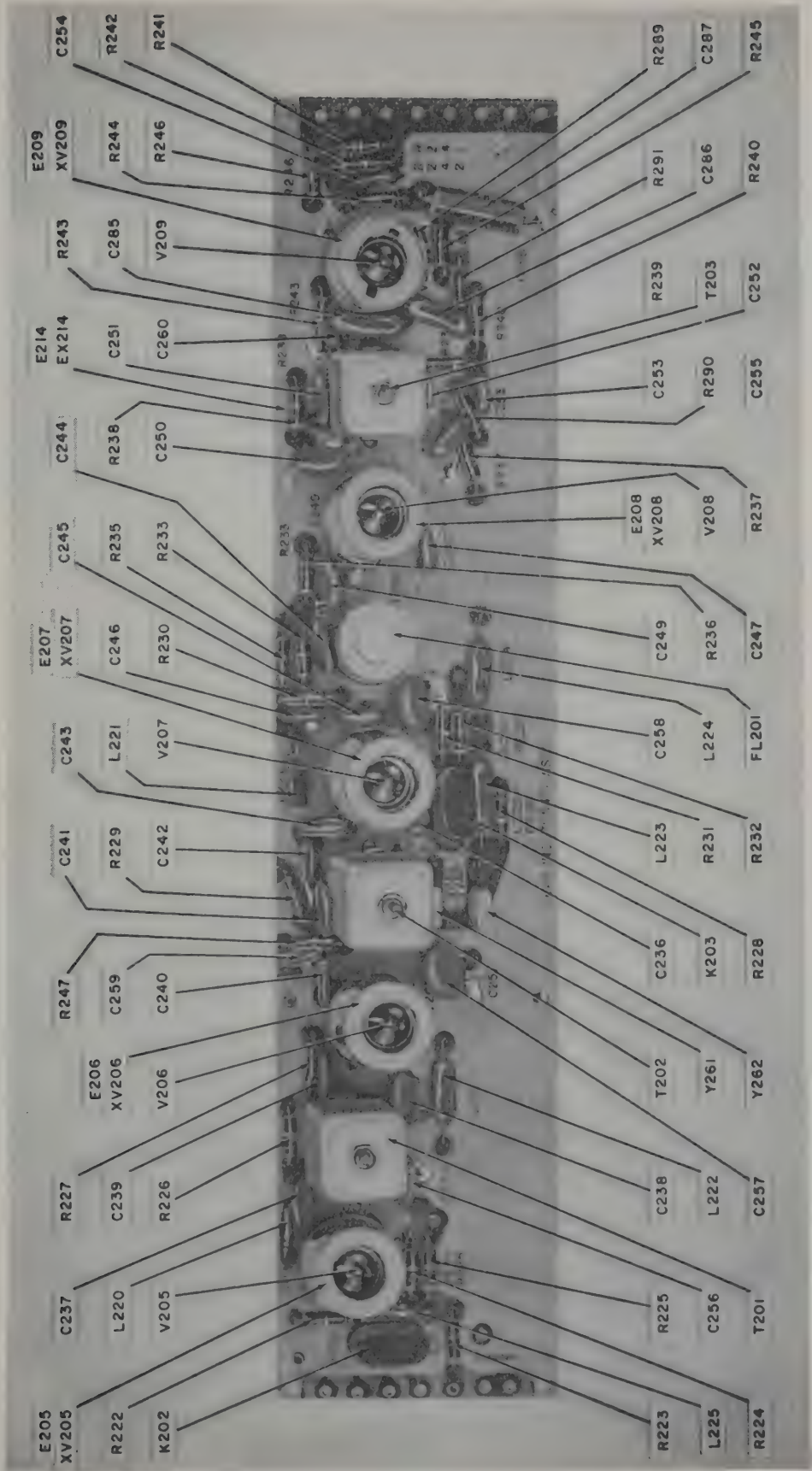


Figure 3-9. I-F Etched Circuit Board

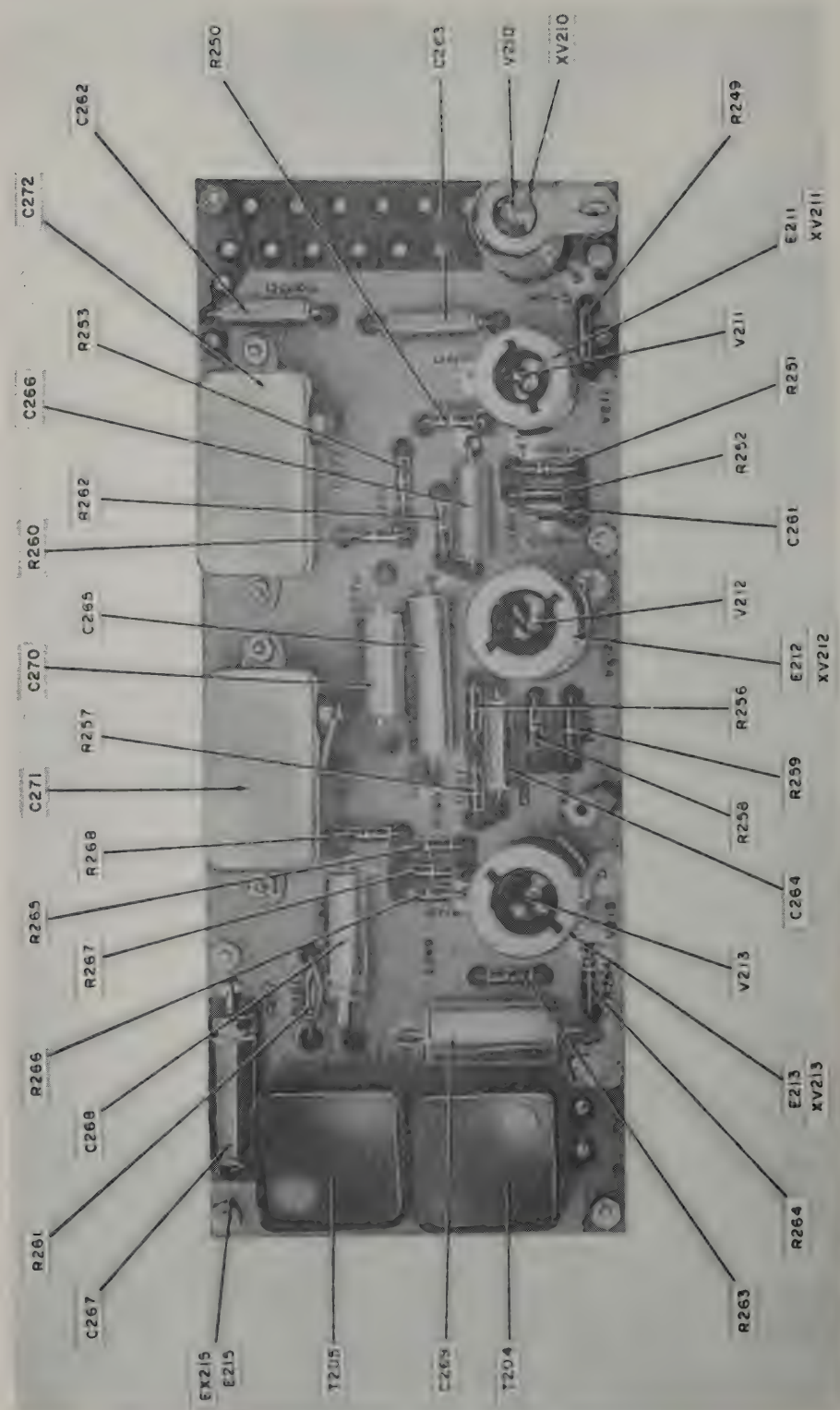


Figure 3-10. Audio Etched Circuit Board

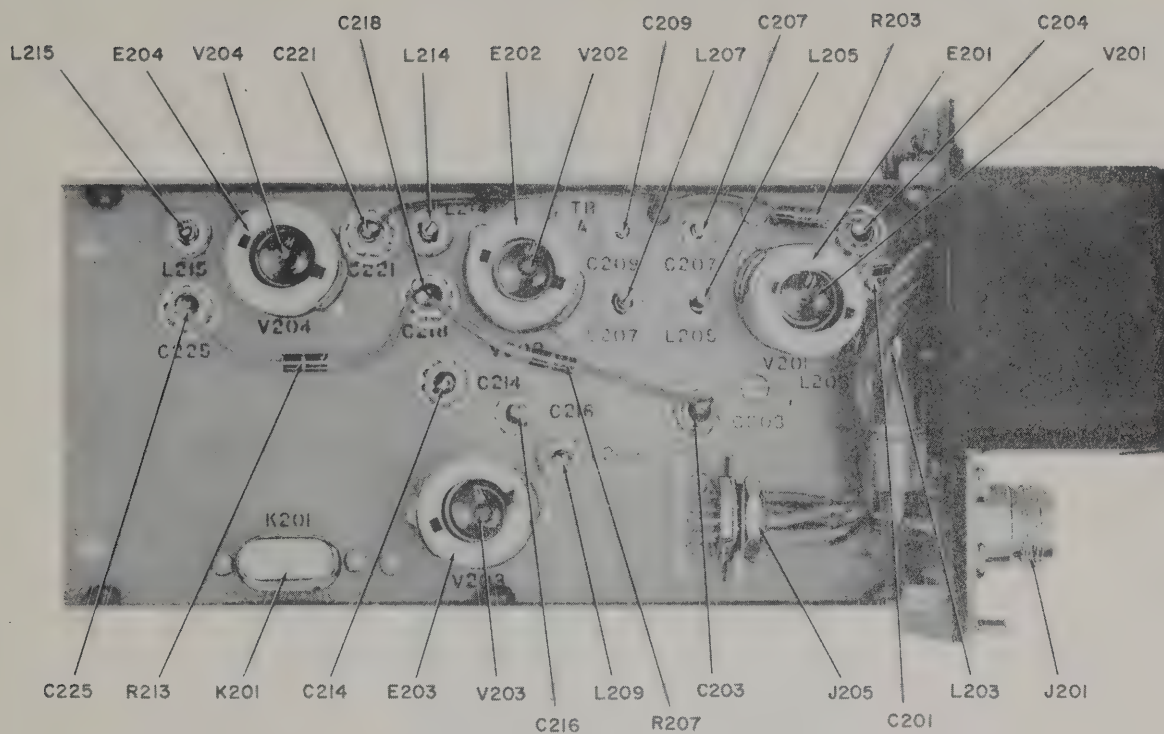


Figure 3-11. Receiver Tuner Assembly, Tube Side

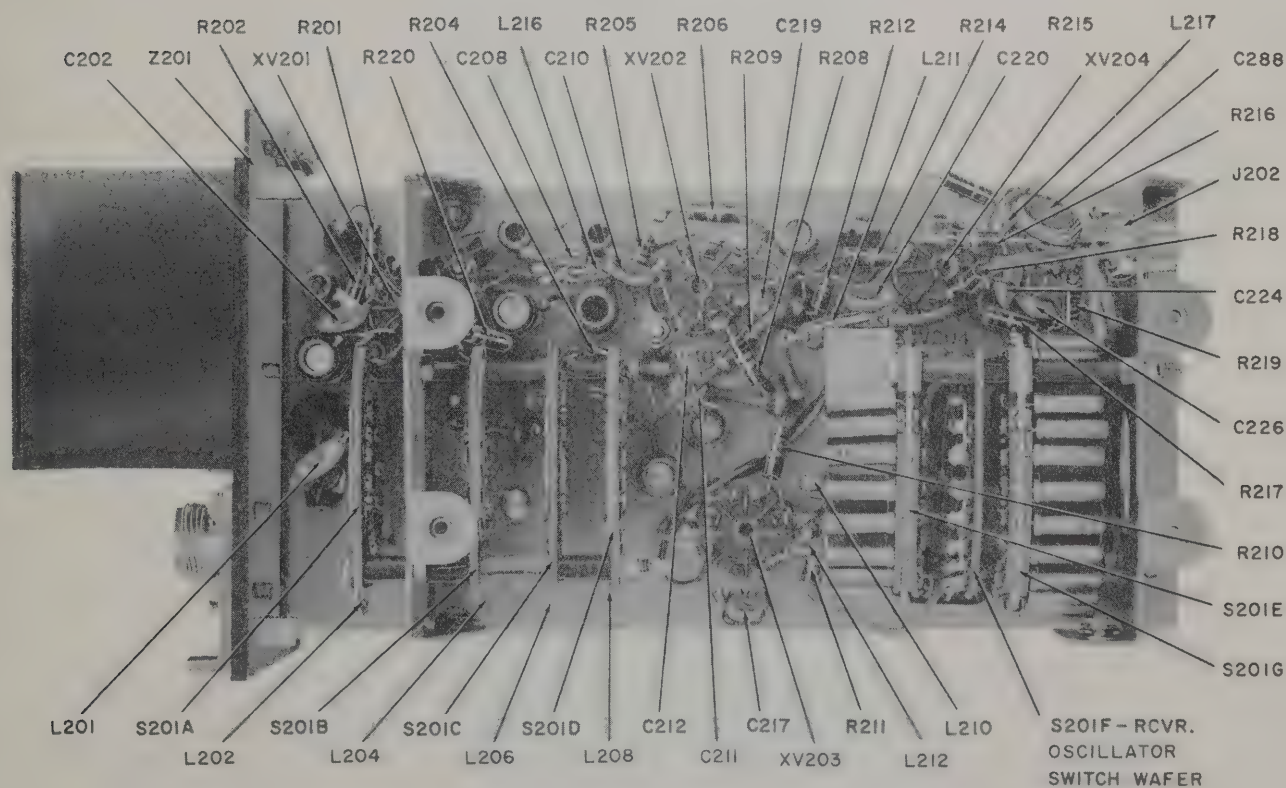


Figure 3-12. Receiver Tuner Assembly, Wiring Side

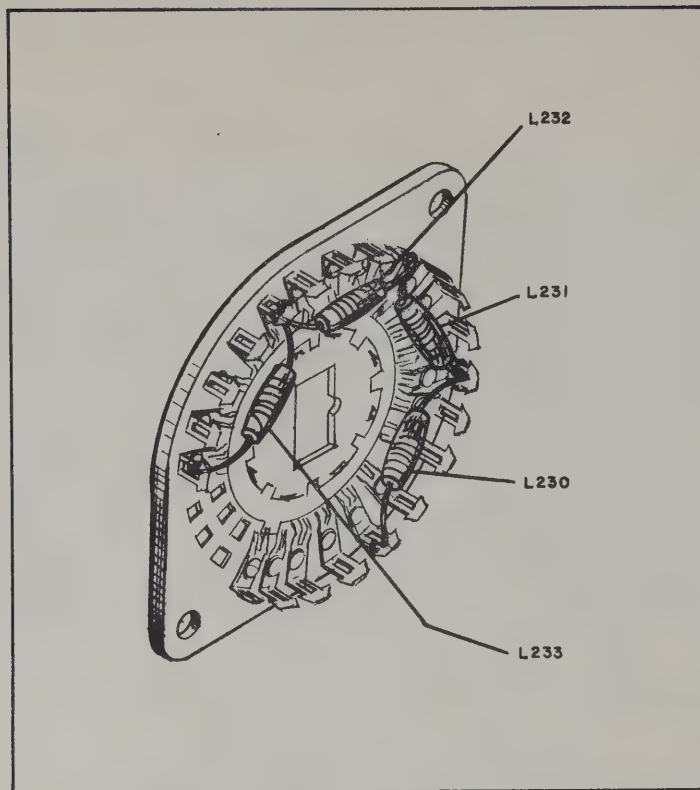


Figure 3-13. S201F, Component Locating Key

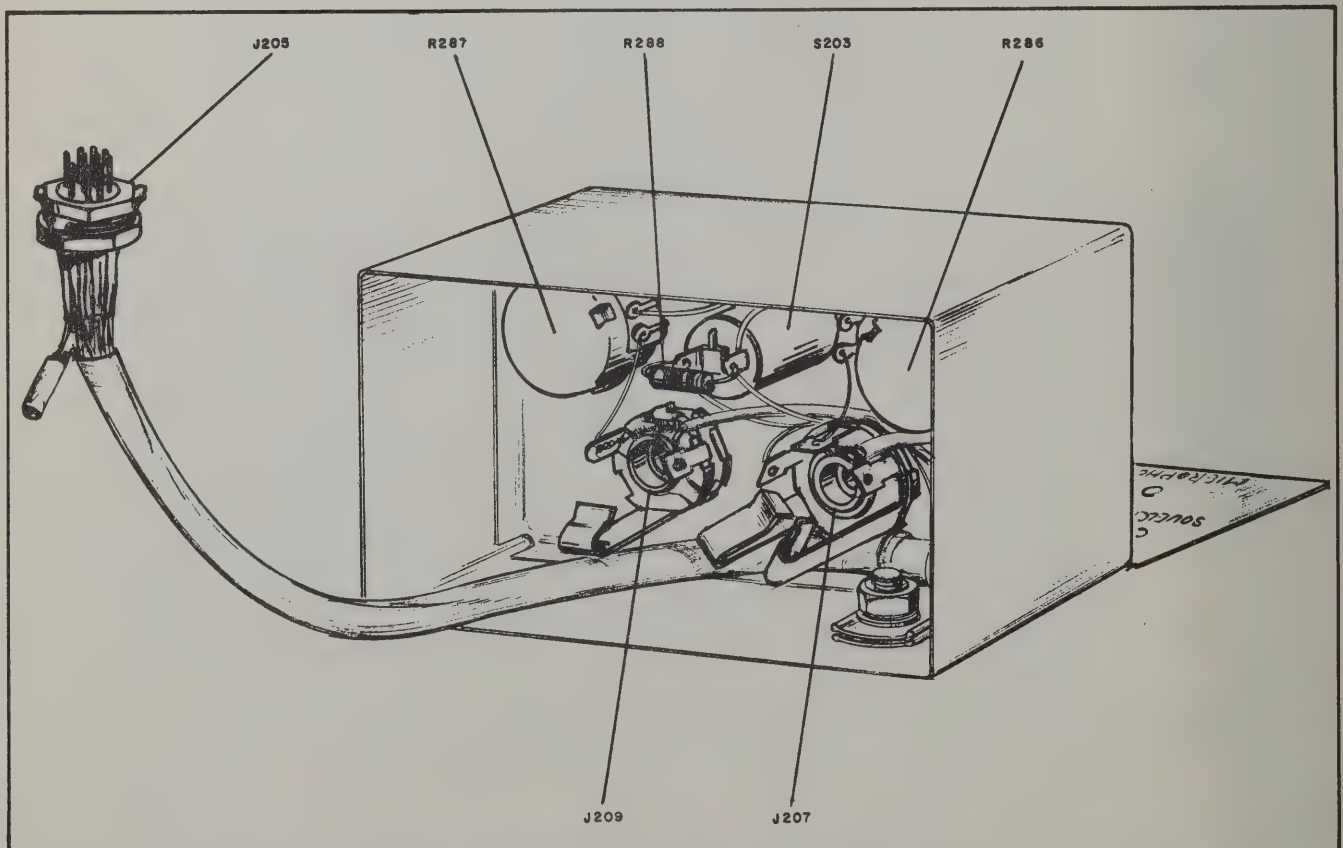


Figure 3-14. Receiver Test Box

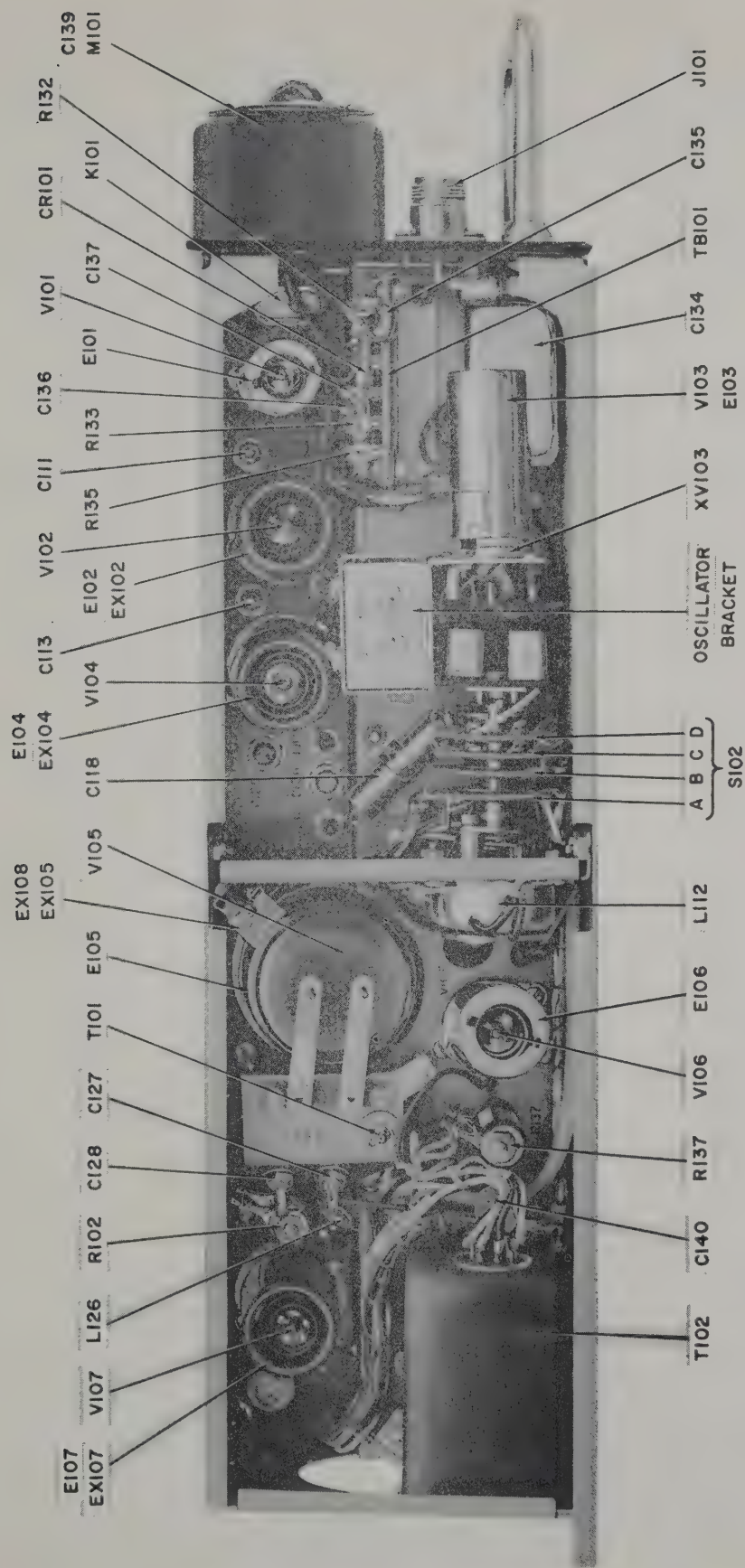


Figure 3-15. Transmitter Unit, Tube Side

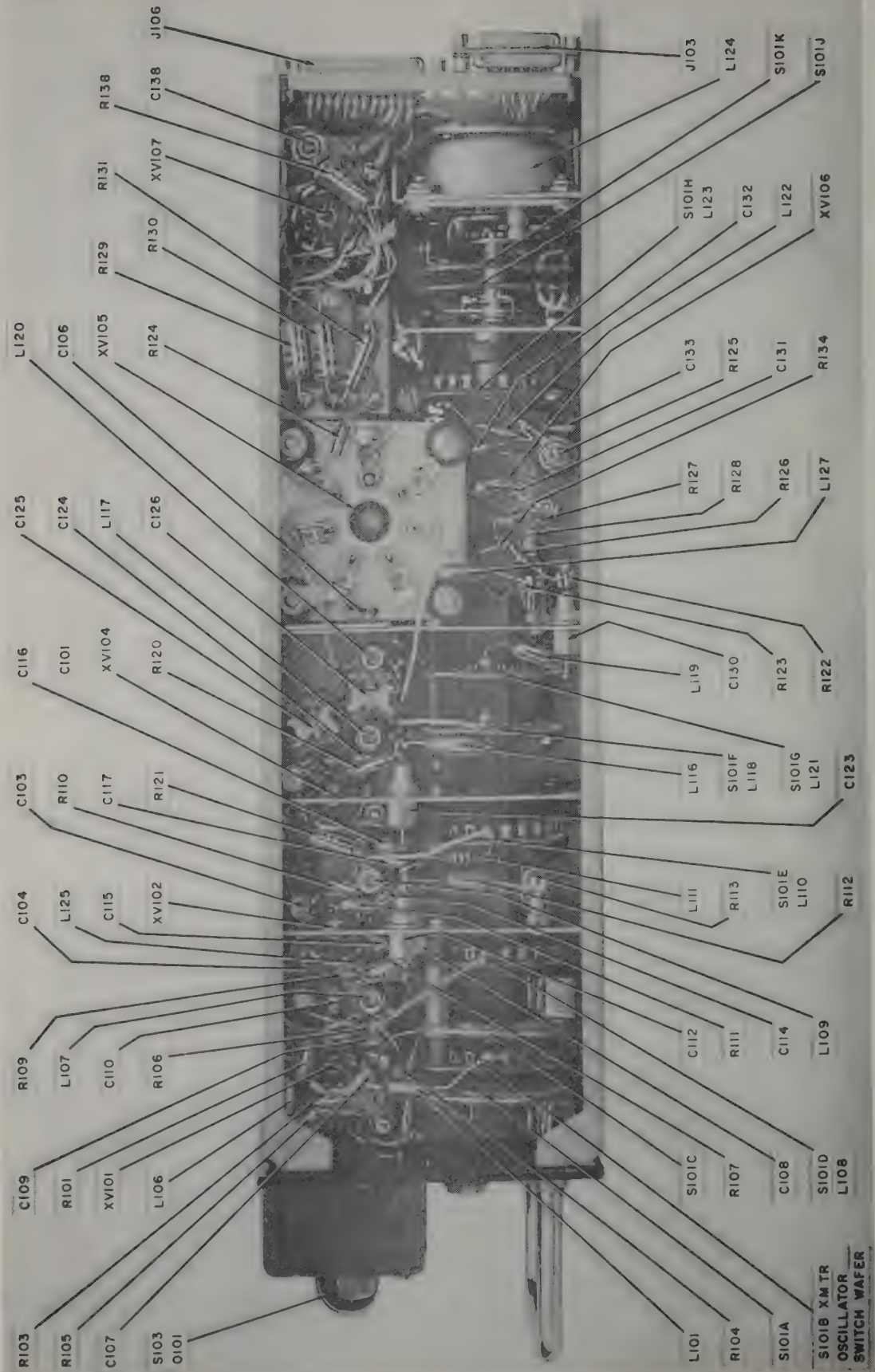


Figure 3-16. Transmitter Unit, Wiring Side

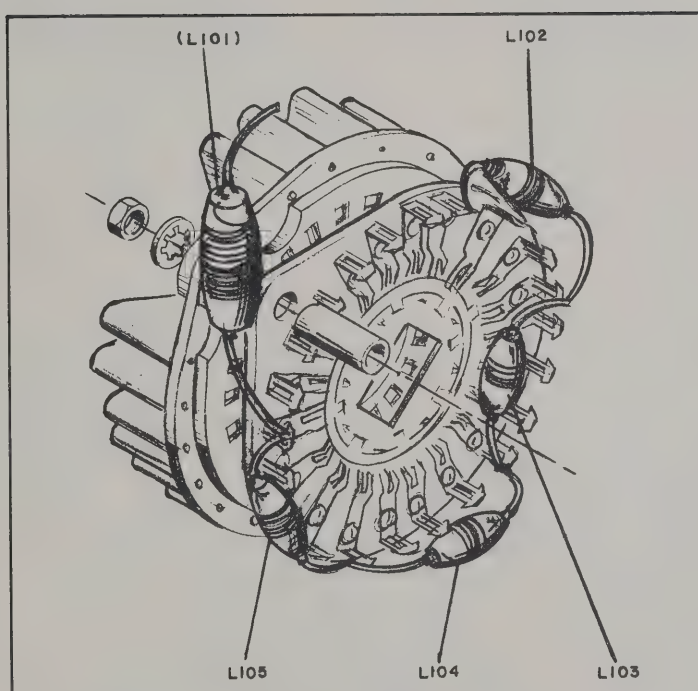


Figure 3-17. S101B Component Locating Key

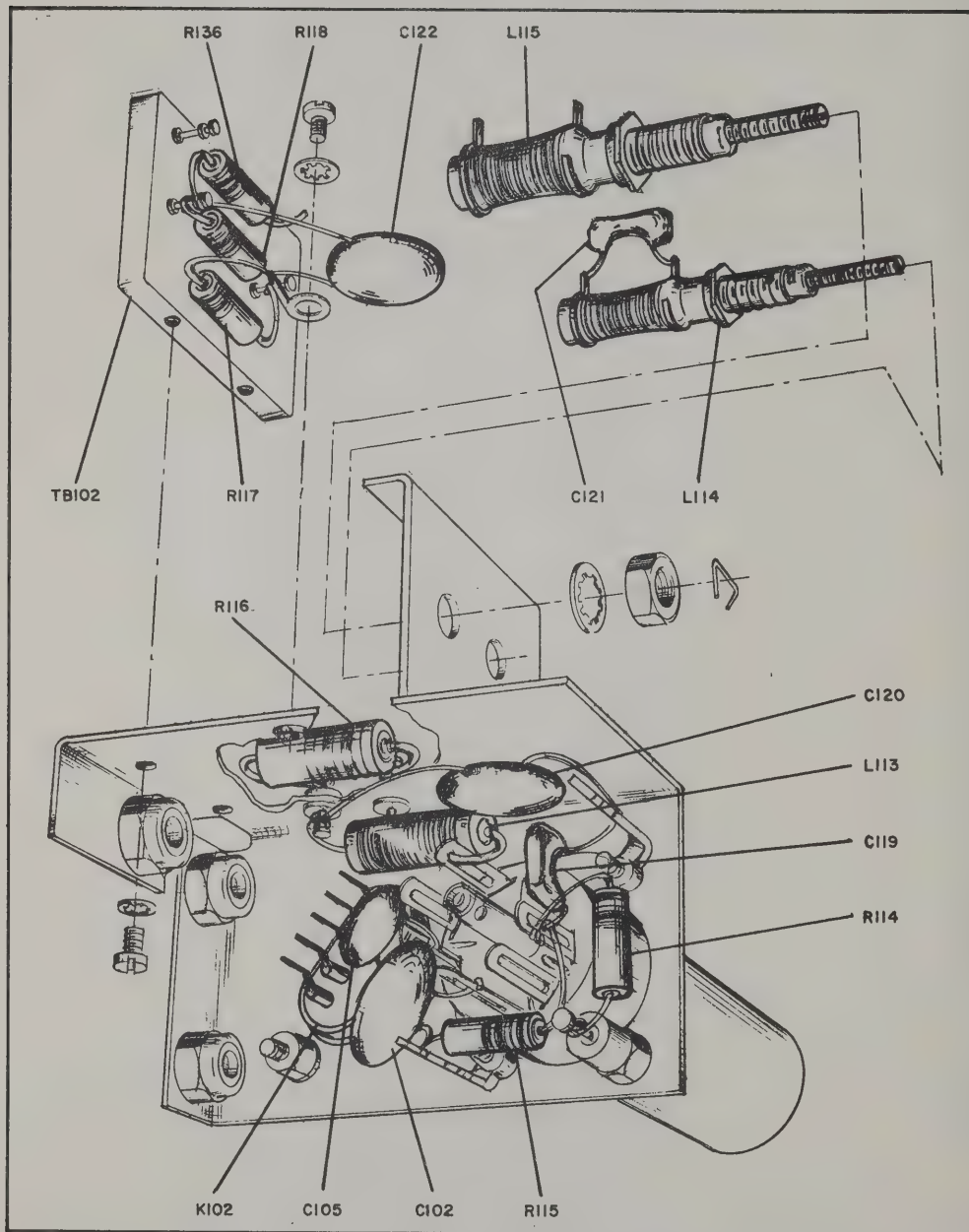
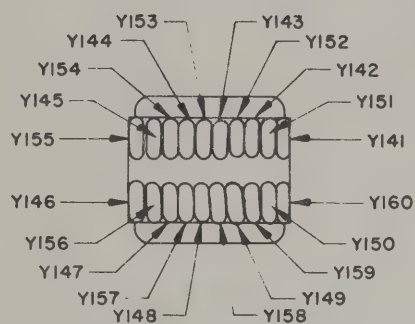
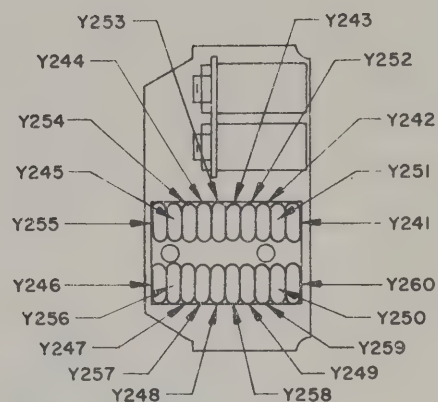


Figure 3-18. Oscillator V103 Mounting Bracket, Component Locating Key

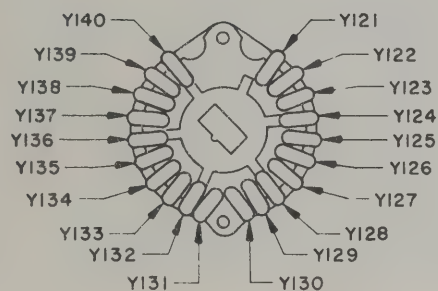
XMTR



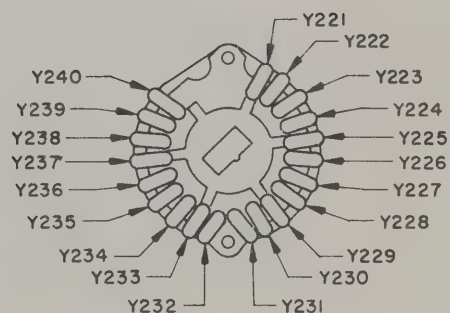
RCVR



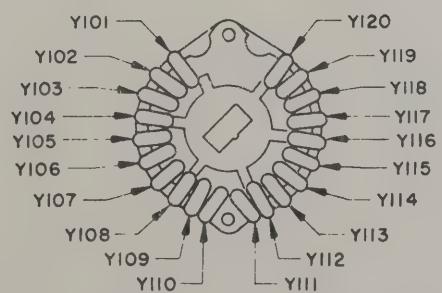
SIOIC



S20IG



SIOIA



S20IE

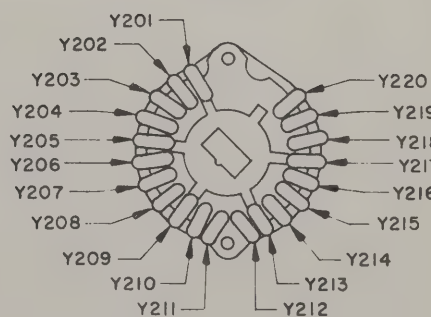


Figure 3-19. Transmitter and Receiver Crystal Locating Key

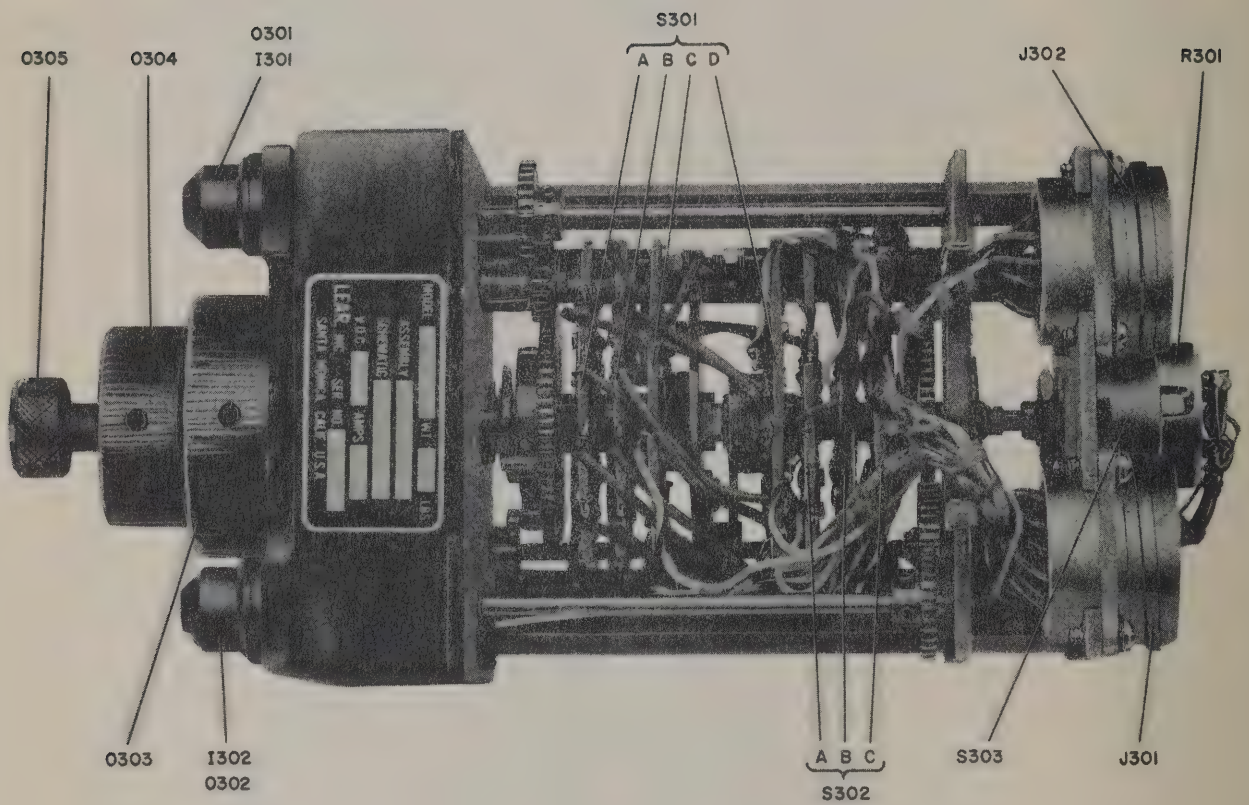
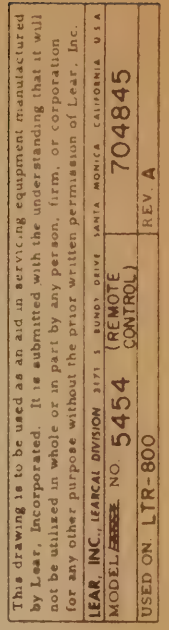
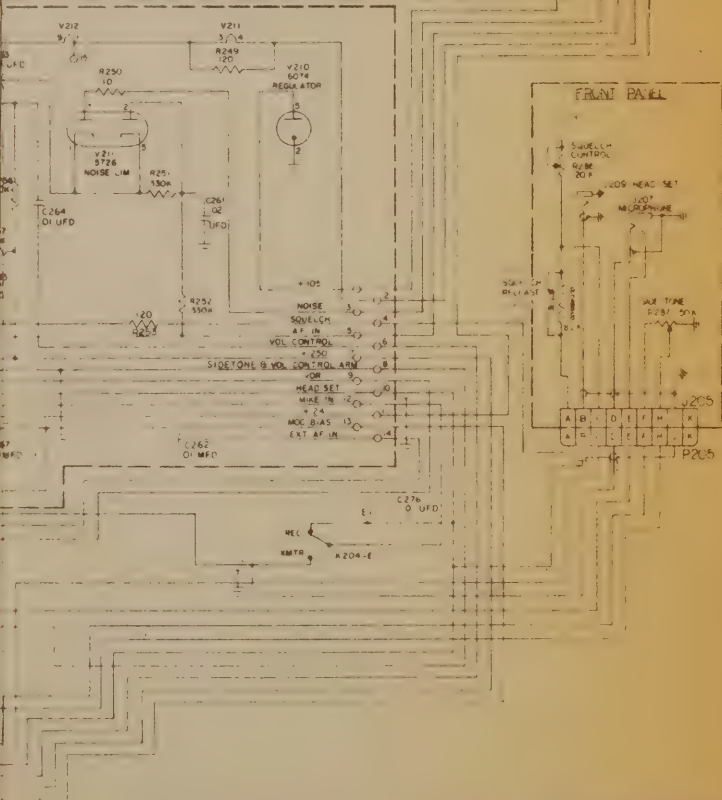
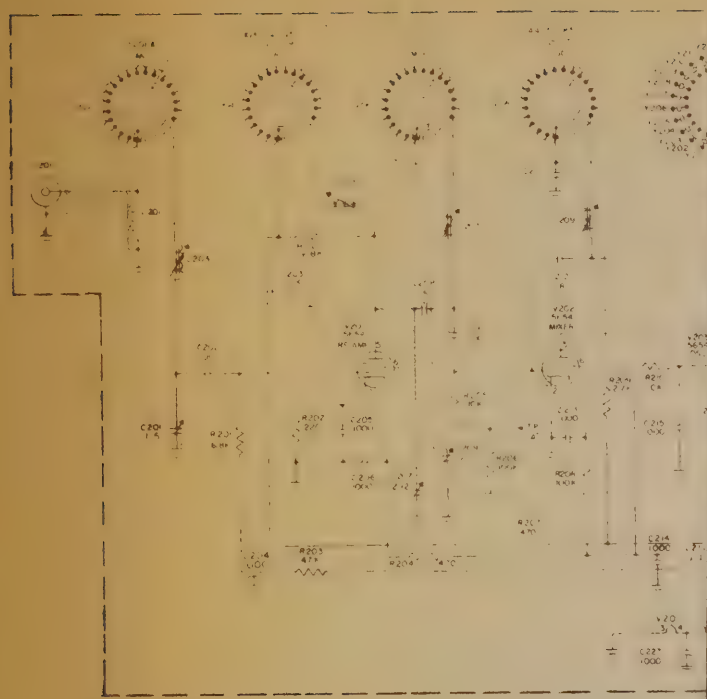


Figure 3-20. Model 5454 Control Head

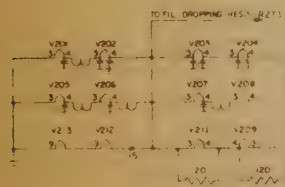


This drawing is to be used as an aid in servicing equipment manufactured by Lear, Incorporated. It is submitted with the understanding that it will not be utilized in whole or in part by any person, firm, or corporation for any other purpose without the prior written permission of Lear, Inc.

LEAR, INC., LEARCLAD DIVISION 3171 S. BURGESS DRIVE SANTA MONICA, CALIFORNIA U.S.A.



5. R-200 AND V-162 PROVIDE 75K CHANNEL SEPARATION ON SPECIAL MODELS NORMALLY THESE ITEMS ARE OMITTED-R-203 BEING REPLACED WITH A JUMPER FROM R-261 TO PIN 1 OF V-207.
6. UNITS HAVING NO CHANNEL SEPARATION ON WILL NOT INCLUDE R-202/FYANT CRYSTALS ON S202B R-202 IS REPLACED WITH A JUMPER WIRE FROM T60W 5 TO L25.
7. ALL CAPACITORS IN USED
8. ALL RESISTORS 1/2 WATT.
9. POS. CONNECTS TO R-203
- 4 POS. CONNECTS TO TRANSMITTER J08
- 5 POS. CONNECTS TO TRANSMITTER J08 FOR SIMPLER OPERATION
- B. CONNECT 1000V CAPACITOR (C78) BETWEEN TERM. J0 (AUDIO ASSY) & E1. A CONNECT JUMPER WIRE BETWEEN TRANSMIT & RECEIPT BLOWN TERMINALS.
2. LOUD SPEAKER OPERATION

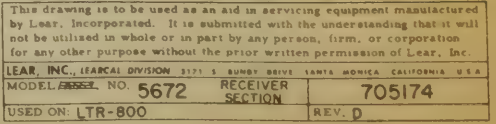


- A. ON IF ASSY. CONNECT JUMPER FROM TERM 15 TO TERM 6
- B. CONNECT JUMPER FROM "T.M." PIN 1 A 50 TO "T.M." IS ON AUDIO ASSY
- C. ON IF ASSY. REMOVE LEAD FROM "T.M." IS B. CONNECT TO "T.M." 1
- D. "T.M." IS 9.27 TO 2.0 BW
- E. GROUND PIN 4 ON X204
- A. ON P202 REMOVE LEAD FROM PIN 5 B. CONNECT "T.M." 1

$$N_2 + F_2 \rightarrow 2NF_3 \quad \Delta H = -103.6 \text{ kJ}$$

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LEAR, INC., LEARL DIVISION 3171 S BUNDY DRIVE SANTA MONICA CALIFORNIA U.S.A.		
MODEL ~~5652~~ NO. 5672	RECEIVER SECTION	705174
USED ON: LTR-800		REV. D

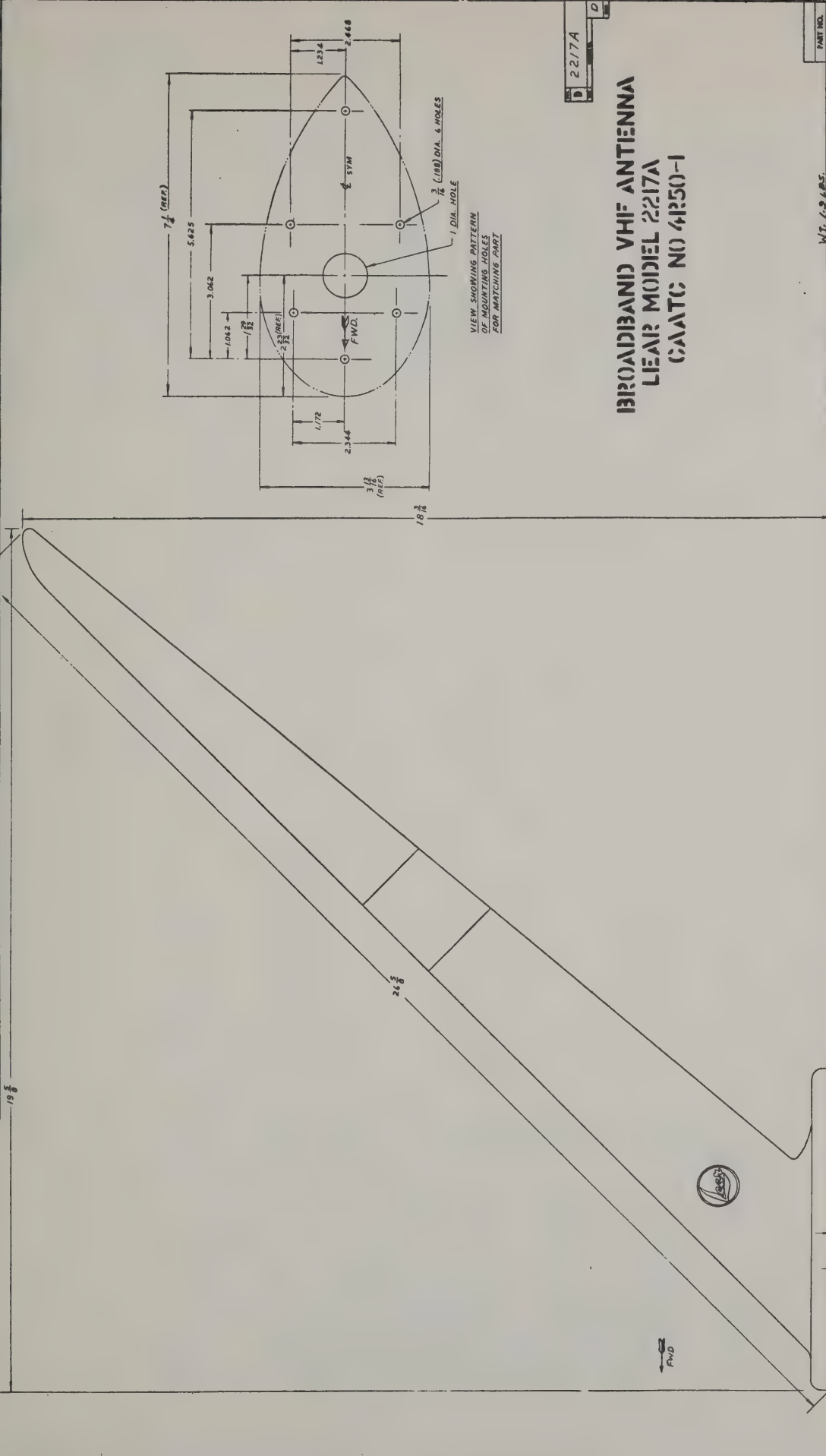


APPENDIX I

Installation Data. The installation drawings for the Model LTR-800 have been included with this manual for reference only. Fully detailed installation instructions are provided with each installation kit.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	12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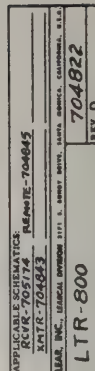
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99	10/17/74	SEE REF			
100	10/17/74	SEE REF			

- 2 CONNECTOR NO 21810 GARNET, PART NO 70R-039
- 1 CABLE- 50 OHM COAXIAL.

NOTES: UNLESS OTHERWISE SPECIFIED:

UHF-500/ CONNECTOR
(REF)
(SEE NOTE 1)

(SIMPLEX OPERATION)



APPENDIX II
PARTS LIST

TRANSMITTER UNIT PARTS LIST

Symbol Number	Description	Function	Part Number	Qty Per Equipment
Series 101-199	Transmitter, VHF, crystal controlled, 14v or 28v. Part of LTR-800 VHF Communication and Navigation System. Approx. 24 7/16 lg x 6 3/8 wide x 9 5/16 h. w/Receiver Unit and Shockmount.	800 Channel (max) VHF Transmitter in the frequency range 118-147.95 mc. 50 or 100 kc channel separation (also 25 kc channel separation on special models.) Remotely controlled by Remote Frequency Selector Model 5454A, -B, -C, or -D, p/o Communication and Navigation System LTR-800.	705135*	1
C101	Capacitor, Fixed, Ceramic Dielectric; 3/8 in. OD disc .001 uf min value 500 wvdc	Filament bypass	90732-03	7
C102	Capacitor, Fixed, Ceramic Dielectric; 19/32 in. OD disc .01 uf -20% /80% 600 wvdc	Filament bypass	90732-11	6
C103	Same as C101	Filament bypass	--	--
C104	Same as C101	Filament bypass	--	--
C105	Same as C101	Filament bypass	--	--
C106	Capacitor, Fixed, Mica Dielectric; 100 uuf $\pm 10\%$ 500 wvdc	Filament bypass	705148-101KE	6
C107	Same as C106	Coupling between grid and cathode of V101	--	--
C108	Same as C102	B $\neq$ bypass	--	--
C109	Same as C101	V101 Screen bypass	--	--
C110	Capacitor, Fixed, Mica Dielectric; 220 uuf $\pm 10\%$ 500 wvdc	Coupling between V101 plate and V102 grid	705148-221KE	1
C111	Capacitor, Variable, Quartz Dielectric; .5 to 5 uuf 1000 wvdc (including nut and washer)	V102 grid tuning	704973-01	4
C112	Capacitor, Fixed, Ceramic Dielectric; 1000 uuf $\pm 20\%$ 500 wvdc (1/4-28 Thread)	B $\neq$ bypass	96509-09	3
C113	Same as C111	V102 plate tuning	--	--
C114	Same as C101	V102 cathode bypass	--	--
C115	Same as C101	V102 screen bypass	--	--
C116	Capacitor, Fixed, Mica Dielectric; 10 uuf $\pm 10\%$ 500 wvdc	Coupling between L110 and pin 1 grid of V104	705148-100KC	2
C117	Same as C116	Coupling between L110 and pin 3 grid of V104	--	--
C118	Capacitor, Fixed, Mica Dielectric; .47 uf $\pm 20\%$ 100 wvdc	L112 Interrupter bypass	705231	1
(*See Section I paragraph 4 for a complete list of assembly and model numbers versus channels, band widths, and operating voltages.)				

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
C119	Capacitor, Fixed, Mica Dielectric; 18 uuf $\pm 2\%$ 500 wvdc	Bypass on K102 armature	705148-180GD	2
C120	Same as C102	V103 Screen bypass	--	--
C121	Same as C119	L114 Tuning	--	--
C122	Same as C102	Bypass on V104 grid circuit	--	--
C123	Same as C112	B $\frac{1}{2}$ bypass	--	--
C124	Same as C106	V104 Screen bypass	--	--
C125	Capacitor, Variable, Air Dielectric; 2.7 to 8.5 uuf 750 vrms breakdown (including 1/4-28 nut and washer)	V104 Plate tuning	97810-11	1
C126	Capacitor, Variable, Air Dielectric; 2.1 to 5.3 uuf 750 vrms breakdown (including 1/4-28 nut and washer)	V105 Grid tuning	97810-10	1
C127	Same as C111	V105 Plate tuning	--	--
C128	Same as C111	V105 Plate tuning	--	--
C130	Same as C112	Bypass between grids of V105 and V106	--	--
C131	Same as C106	Develops V106 dc grid bias	--	--
C132	Same as C106	V106 Plate bypass and screen bypass	--	--
C133	Same as C102	Af coupling to V105 screen	--	--
C134	Capacitor, Fixed, Electrolytic; 6 uf 400 wvdc dry polarized	Af bypass	CE61C060Q	1
C135	Capacitor, Fixed, Mica Dielectric; 5 uuf $\pm 10\%$ 500 wvdc	Coupling between T101 secondary and CR101	705148-050KC	1
C136	Same as C106	P/o sidetone rf filter	--	--
C137	Capacitor, Fixed, Ceramic Dielectric; 19/32 in. OD disc .01 uf min value 500 wvdc	Sidetone coupling between CR101 and J106 pin 14	90732-07	2
C138	Capacitor, Fixed, Paper Dielectric; .47 uf $\pm 20\%$ 100 wvdc (including 5/16-24 nut and washer)	L124 Interrupter bypass	97817-02	1
C139	Same as C137	M101 bypass	--	--
C140	Same as C102	B $\frac{1}{2}$ bypass	--	--
CR101	Rectifier, Germanium; 1N63	Sidetone detection	82130-14	1
E101	Shield, Electron Tube	Shields V101	96668-01	1
E102	Shield, Electron Tube	Shields V102	703676-02	1
E103	Shield, Electron Tube	Shields V103	96668-02	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
E104	Shield, Electron Tube	Shields V104	703676-06	2
E105	Shield, Electron Tube	Shields V105	703319	1
E106	Shield, Electron Tube	Shields V106	96668-05	1
E107	Same as E104	Shield V107	--	--
EX102	Base, Tube Shield	Retains E102	703675-02	3
EX104	Same as EX102	Retains E104	--	--
EX105	Clamp, Electron Tube	Retains V105	705121	1
EX107	Same as EX102	Retains E107	--	--
EX108	Support, Tube Clamp	Supports EX105	705120	1
J101	Connector, Receptacle; 1 pin, male	Antenna connector	UG58/U	1
J103	Connector, Receptacle; 15 pin, male	Connects Transmitter Unit to Receiver Unit during simplex operation; mates w/ P203	702466-01	1
J106	Connector, Receptacle; 25 pin, male	Connects Transmitter Unit to Receiver Unit; mates w/ P206	702466-02	1
K101	Relay, Micro-miniature, DPDT; 14v	Connects crystals on S101-A or S101-C to coils on S101-B (14v operation only)	S15000-02	2
	Relay, Micro-miniature, DPDT, 28v	Connects crystals on S101-A or S101-C to coils on S101-B (28v operation only)	S15000-01	
K102	Same as K101	Connects crystals on S102-C or S102-D to grid of V103	--	--
L101	Coil, RF	V101 Grid tuning	705141-06	2
L102	Coil, RF	V101 Grid tuning	705141-07	4
L103	Same as L102	V101 Grid tuning	--	--
L104	Same as L102	V101 Grid tuning	--	--
L105	Same as L102	V101 Grid tuning	--	--
L106	Coil, RF	V101 Cathode rf choke	705141-05	2
L107	Coil, RF, Adjustable	V101 Plate tuning	705472	1
L108	Coil, RF, Adjustable (p/o S101-D)	V101 Plate tuning	--	--
L109	Coil, RF, Adjustable	V102 Plate tuning	705473	1
L110	Coil, RF, Adjustable (p/o S101-E)	V102 Plate tuning	--	--
L111	Coil, RF	B ₁ rf choke	97743	2
L112	Relay, Rotary; 14v (including S102-A, -B, -C, -D)	Tracks setting of switches in Remote Frequency Selector (14v operation only)	703502-01	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
	Relay, Rotary, 28v (including S102-A, -B, -C, -D)	Tracks setting of switches in Remote Frequency Selector (28v operation only)	703502-02	
L113	Same as L106	B ₁ rf choke	--	--
L114	Coil, RF, Adjustable	Primary of coupling transformer between V103 plate and V104 grids	705479	1
L115	Coil, RF, Adjustable	Secondary of coupling transformer between V103 plate and V104 grids	705480	1
L116	Coil, RF	B ₁ rf choke	705141-09	1
L117	Coil, RF, Adjustable	Primary of coupling transformer between V104 plates and V105 grids	706667	1
L118	Coil, RF, Adjustable (p/o S101-F)	V104 plate tuning	--	--
L119	Coil, RF	Rf choke between grids of V105 and V106	96880	2
L120	Coil, RF, Adjustable	Secondary of coupling transformer between V104 plates and V105 grids	706574	1
L121	Coil, RF, Adjustable (p/o S101-G)	V105 grid tuning	--	--
L122	Same as L101	B ₁ rf choke	--	--
L123	Coil, RF, Adjustable (p/o S101-H)	V105 Plate tuning	--	--
L124	Relay, Rotary; 14v (including S101-J, -K)	Tracks setting of switches in Remote Frequency Selector (14v operation only)	704824-01	1
	Relay, Rotary; 28v (including S101-J, -K)	Tracks setting of switches in Remote Frequency Selector (28v operation only)	704824-02	
L125	Same as L111	V102 grid tuning	--	--
L126	Coil, RF	Antenna impedance matching	706299	1
L127	Same as L119	Prevents rf feedback from V105 filament	--	--
M101	Meter	A ₁ , B ₁ , power output, mixer grid, and power amplifier grid checking	704957	1
O101	Knob	Attaches to shaft of S103	96092-01	1
R101	Resistor, Fixed, Wire Wound; 50 ohm $\pm 10\%$ 3w	V101 filament shunt	704888-07	1
R102	Resistor, Fixed, Wire Wound; 2 ohm $\pm 10\%$ 8w	Filament voltage dropping (28v operation only)	702557-13	1
	Resistor, Fixed, Wire Wound; 1 ohm $\pm 10\%$ 8w	Filament voltage dropping (14v operation only)	702557-12	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Learn Part Number	Qty Per Equipment
R103	Resistor, Fixed, Composition; 47,000 ohm $\pm 5\%$ 1/2w	Prevents shorting of V101 grid signal during testing	56988	5
R104	Resistor, Fixed, Composition; 22,000 ohm $\pm 5\%$ 1/2w	V101 Grid return	56980	3
R105	Resistor, Fixed, Composition; 100 ohm $\pm 5\%$ 1/2w	V101 cathode bias	56924	1
R106	Resistor, Fixed, Composition; 56,000 ohm $\pm 5\%$ 1/2w	V101 screen voltage dropping	56990	1
R107	Resistor, Fixed, Composition; 10,000 ohm $\pm 5\%$ 1w	P/o V101 plate load	57238	1
R109	Same as R103	V102 grid return	--	--
R110	Resistor, Fixed, Composition; 150 ohm $\pm 5\%$ 1/2w	V102 cathode bias	56928	2
R111	Resistor, Fixed, Composition; 5,600 ohm $\pm 5\%$ 1/2w	V102 screen voltage dropping	56966	1
R112	Resistor, Fixed, Wire Wound; 700 ohm $\pm 5\%$ 3w	B _L voltage dropping	704888-17	1
R113	Resistor, Fixed, Wire Wound; 800 ohm $\pm 5\%$ 3w	B _L voltage dropping	704888-18	1
R114	Same as R103	Prevents shorting of V103 grid signal during testing	--	--
R115	Same as R104	V103 grid return	--	--
R116	Resistor, Fixed, Composition; 39,000 ohm $\pm 5\%$ 1w	V103 screen voltage dropping	57252	1
R117	Resistor, Fixed, Composition; 56 ohm $\pm 5\%$ 1/2w	V104 grid return	56918	1
R118	Same as R104	Prevents shorting of V104 grid signal through M101 in MIX _G position of S103	--	--
R120	Same as R103	V104 screen voltage dropping	--	--
R121	Resistor, Fixed, Composition; 220 ohm $\pm 5\%$ 1w	V104 cathode bias	57198	1
R122	Resistor, Fixed, Composition; 10,000 ohm $\pm 10\%$ 1/2w	Prevents shorting of V105 grid signal thru M101 in PA _G position of S103	57088	1
R123	Resistor, Fixed, Composition; 18 ohm $\pm 5\%$ 1/2w	V105 and V106 grid return	56906	1
R124	Resistor, Fixed, Composition; 180 ohm $\pm 5\%$ 1/2w	V105 screen voltage dropping	56930	1
R125	Resistor, Fixed, Wire Wound; 5000 ohm $\pm 10\%$ 10w	Develops cut-off bias on V105 screen	702557-10	1
R126	Resistor, Fixed, Composition; 100,000 ohm $\pm 5\%$ 1/2w	P/o grid bias rc network of V106	56996	1
R127	Same as R110	V106 cathode bias	--	--
R128	Resistor, Fixed, Composition; 22,000 ohm $\pm 5\%$ 1w	V106 screen voltage dropping	57246	1
R129	Resistor, Fixed, Composition; 27,000 ohm $\pm 5\%$ 2w	V107 screen grid bias	57538	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
R130	Resistor, Fixed, Composition; 10,000 ohm $\pm 5\%$ 2w	V107 screen voltage dropping	57528	1
R131	Resistor, Fixed, Composition; 8,200 ohm $\pm 5\%$ 2w	Reduces V107 gain when V107 is used as an amplifier for equipment external to LTR-800	57526	1
R132	Resistor, Fixed, Composition; 15,000 ohm $\pm 5\%$ 1/2w	Prevents shorting of antenna signal thru M101 in P _O position of S103	56976	1
R133	Resistor, Fixed, Composition; 8,200 ohm $\pm 10\%$ 1/2w	P/o sidetone rf filter	57087	1
R134	Resistor, Fixed, Composition; 390,000 ohm $\pm 5\%$ 1/2w	Prevents overloading of M101 in B $\nearrow$ position of S103	57010	1
R135	Resistor, Fixed, Composition; 39,000 ohm $\pm 10\%$ 1/2w	Prevents overloading of M101 in A $\nearrow$ position of S103 (28v operation only)	57095	1
	Resistor, Fixed, Composition; 20,000 ohm $\pm 5\%$ 1/2w	Prevents overloading of M101 in A $\nearrow$ position of S103 (14v operation only)	56979	
R136	Same as R103	Prevents shorting of V104 grid signal during testing	--	--
R137	Resistor, Fixed, Wire Wound; 800 ohm $\pm 10\%$ 10w	B $\nearrow$ series filter impedance	702557-09	1
R138	Resistor, Fixed, Composition; 47 ohm $\pm 10\%$ 1w	L124 shunt	57326	1
S101-A	Switch Section, Rotary	Selects crystals Y101 through Y120	704838	1
S101-B	Switch Section, Rotary	Selects coils L102 through L105	704836	1
S101-C	Switch Section, Rotary	Selects crystals Y121 through Y140	704837	1
S101-D	Switch Section, Rotary (includes coil L108)	Taps coil L108	705166-01	1
S101-E	Switch Section, Rotary (includes coil L110)	Taps coil L110	705166-02	1
S101-F	Switch Section, Rotary (includes coil L118)	Taps coil L118	705173	2
S101-G	Switch Section, Rotary (includes coil L121)	Taps coil L121	--	--
S101-H	Switch Section, Rotary (includes coil L123)	Taps coil L123	705166-03	1
S101-J	Switch Section, Rotary (p/o L124)	Actuates L124	712815	1
S101-K	Switch Section, Rotary (p/o L124)	Actuates L124	712816	1
S102-A	Switch Section, Rotary (p/o L112)	Actuates L112	712817	1
S102-B	Switch Section, Rotary (p/o L112)	Actuates L112	712818	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Learn Part Number	Qty Per Equipment
S102-C	Switch Section, Rotary (p/o L112)	Selects crystals Y151 through Y160	712819	2
S102-D	Same as S102-C (p/o L112)	Selects crystals Y141 through Y150	--	--
S103	Switch, Rotary	Determines circuit of meter M101	704956	1
T101	Transformer, RF	Couples V105 to J101	706575	1
T102	Transformer, AF	Couples V107 to V105	703762	1
TB101	Terminal Board	Soldering terminals	705012	1
TB102	Terminal Board	Soldering terminals	705149	1
V101	Electron tube; 5654	Oscillator-doubler	S12000-017	1
V102	Electron tube; 5686	Doubler	S12000-018	2
V103	Electron tube; 6136	Oscillator	S12000-023	1
V104	Electron tube; 6360	Mixer-driver	S12000-026	2
V105	Electron tube; 6252	Final power amplifier	S12000-025	1
V106	Same as V102	Protective cut-off	--	--
V107	Same as V104	Modulator	--	--
XV101	Socket, Electron Tube	Mounts V101	96078	2
XV102	Socket, Electron Tube	Mounts V102	91801-01	3
XV103	Same as XV101	Mounts V103	--	--
XV104	Same as XV102	Mounts V104	--	--
XV105	Socket, Electron Tube	Mounts V105	704960	1
XV106	Socket, Electron Tube	Mounts V106	96077	1
XV107	Same as XV102	Mounts V107	--	--
Y101	Crystal, Quartz; 23.500 mc	108-108.95 mc crystal. See table 2-4	703978-108	1
Y102	Crystal, Quartz; 24.000 mc	110-110.95 mc crystal. See table 2-4	703978-110	1
Y103	Crystal, Quartz; 24.500 mc	112-112.95 mc crystal. See table 2-4	703978-112	1
Y104	Crystal, Quartz; 25.000 mc	114-114.95 mc crystal. See table 2-4	703978-114	1
Y105	Crystal, Quartz; 25.500 mc	116-116.95 mc crystal. See table 2-4	703978-116	1
Y106	Crystal, Quartz; 26.000 mc	118-118.95 mc crystal. See table 2-4	703978-118	1
Y107	Crystal, Quartz; 26.500 mc	120-120.95 mc crystal. See table 2-4	703978-120	1
Y108	Crystal, Quartz; 27.000 mc	122-122.95 mc crystal. See table 2-4	703978-122	1
Y109	Crystal, Quartz; 27.500 mc	124-124.95 mc crystal. See table 2-4	703978-124	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
Y110	Crystal, Quartz; 28.000 mc	126-126.95 mc crystal. See table 2-4	703978-126	1
Y111	Crystal, Quartz; 28.500 mc	128-128.95 mc crystal. See table 2-4	703978-128	1
Y112	Crystal, Quartz; 29.000 mc	130-130.95 mc crystal. See table 2-4	703978-130	1
Y113	Crystal, Quartz; 29.500 mc	132-132.95 mc crystal. See table 2-4	703978-132	1
Y114	Crystal, Quartz; 30.000 mc	134-134.95 mc crystal. See table 2-4	703978-134	1
Y115	Crystal, Quartz; 30.500 mc	136-136.95 mc crystal. See table 2-4	703978-136	1
Y116	Crystal, Quartz; 31.000 mc	138-138.95 mc crystal. See table 2-4	703978-138	1
Y117	Crystal, Quartz; 31.500 mc	140-140.95 mc crystal. See table 2-4	703978-140	1
Y118	Crystal, Quartz; 32.000 mc	142-142.95 mc crystal. See table 2-4	703978-142	1
Y119	Crystal, Quartz; 32.500 mc	144-144.95 mc crystal. See table 2-4	703978-144	1
Y120	Crystal, Quartz; 33.000 mc	146-146.95 mc crystal. See table 2-4	703978-146	1
Y121	Crystal, Quartz; 23.750 mc	109-109.95 mc crystal. See table 2-4	703978-109	1
Y122	Crystal, Quartz; 24.250 mc	111-111.95 mc crystal. See table 2-4	703978-111	1
Y123	Crystal, Quartz; 24.750 mc	113-113.95 mc crystal. See table 2-4	703978-113	1
Y124	Crystal, Quartz; 25.250 mc	115-115.95 mc crystal. See table 2-4	703978-115	1
Y125	Crystal, Quartz; 25.750 mc	117-117.95 mc crystal. See table 2-4	703978-117	1
Y126	Crystal, Quartz; 26.250 mc	119-119.95 mc crystal. See table 2-4	703978-119	1
Y127	Crystal, Quartz; 26.750 mc	121-121.95 mc crystal. See table 2-4	703978-121	1
Y128	Crystal, Quartz; 27.250 mc	123-123.95 mc crystal. See table 2-4	703978-123	1
Y129	Crystal, Quartz; 27.750 mc	125-125.95 mc crystal. See table 2-4	703978-125	1
Y130	Crystal, Quartz; 28.250 mc	127-127.95 mc crystal. See table 2-4	703978-127	1
Y131	Crystal, Quartz; 28.750 mc	129-129.95 mc crystal. See table 2-4	703978-129	1
Y132	Crystal, Quartz; 29.250 mc	131-131.95 mc crystal. See table 2-4	703978-131	1
Y133	Crystal, Quartz; 29.750 mc	133-133.95 mc crystal. See table 2-4	703978-133	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
Y134	Crystal, Quartz; 30.250 mc	135-135.95 mc crystal. See table 2-4	703978-135	1
Y135	Crystal, Quartz; 30.750 mc	137-137.95 mc crystal. See table 2-4	703978-137	1
Y136	Crystal, Quartz; 31.250 mc	139-139.95 mc crystal. See table 2-4	703978-139	1
Y137	Crystal, Quartz; 31.750 mc	141-141.95 mc crystal. See table 2-4	703978-141	1
Y138	Crystal, Quartz; 32.250 mc	143-143.95 mc crystal. See table 2-4	703978-143	1
Y139	Crystal, Quartz; 32.750 mc	145-145.95 mc crystal. See table 2-4	703978-145	1
Y140	Crystal, Quartz; 33.250 mc	147-147.95 mc crystal. See table 2-4	703978-147	1
Y141	Crystal, Quartz; 14.000 mc	XXX.OO mc crystal. See table 2-4	704862-00	1
Y142	Crystal, Quartz; 14.100 mc	XXX.10 mc crystal. See table 2-4	704862-10	1
Y143	Crystal, Quartz; 14.200 mc	XXX.20 mc crystal. See table 2-4	704862-20	1
Y144	Crystal, Quartz; 14.300 mc	XXX.30 mc crystal. See table 2-4	704862-30	1
Y145	Crystal, Quartz; 14.400 mc	XXX.40 mc crystal. See table 2-4	704862-40	1
Y146	Crystal, Quartz; 14.500 mc	XXX.50 mc crystal. See table 2-4	704862-50	1
Y147	Crystal, Quartz; 14.600 mc	XXX.60 mc crystal. See table 2-4	704862-60	1
Y148	Crystal, Quartz; 14.700 mc	XXX.70 mc crystal. See table 2-4	704862-70	1
Y149	Crystal, Quartz; 14.800 mc	XXX.80 mc crystal. See table 2-4	704862-80	1
Y150	Crystal, Quartz; 14.900 mc	XXX.90 mc crystal. See table 2-4	704862-90	1
Y151	Crystal, Quartz; 14.050 mc	XXX.05 mc crystal. See table 2-4	704862-05	1
Y152	Crystal, Quartz; 14.150 mc	XXX.15 mc crystal. See table 2-4	704862-15	1
Y153	Crystal, Quartz; 14.250 mc	XXX.25 mc crystal. See table 2-4	704862-25	1
Y154	Crystal, Quartz; 14.350 mc	XXX.35 mc crystal. See table 2-4	704862-35	1
Y155	Crystal, Quartz; 14.450 mc	XXX.45 mc crystal. See table 2-4	704862-45	1
Y156	Crystal, Quartz; 14.550 mc	XXX.55 mc crystal. See table 2-4	704862-55	1
Y157	Crystal, Quartz; 14.650 mc	XXX.65 mc crystal. See table 2-4	704862-65	1

TRANSMITTER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
Y158	Crystal, Quartz; 14.750 mc	XXX.75 mc crystal. See table 2-4	704862-75	1
Y159	Crystal, Quartz; 14.850 mc	XXX.85 mc crystal. See table 2-4	704862-85	1
Y160	Crystal, Quartz; 14.950 mc	XXX.95 mc crystal. See table 2-4	704862-95	1

RECEIVER UNIT PARTS LIST

Series 201 to 299	Receiver, VHF, crystal controlled, 14v or 28v. Part of LTR-800 VHF Communication and Navigation System. Approx. 24-7/16 lg x 6-3/8 wd x 9-5/16 in. h w/ Transmitter Unit and Shockmount.	800-channel (max) VHF superheterodyne Receiver in the range 108-147.95 mc, 50 or 100 kc channel separation, (also 25 kc channel separation on special models). Remotely controlled by Remote Frequency Selector Model 5454A, -B, -C, or -D, p/o Communication and Navigation System LTR-800.	705464*	1
C201	Capacitor, Variable, Ceramic Dielectric; .5 to 4.5 uuf 500 wvdc (including no. 8-32 hex nut, no. 8-32 lock washer and lock nut)	V201 grid tuning	703721-02	1
C202	Capacitor, Fixed, Mica Dielectric; 100 uuf $\pm 10\%$ 500 wvdc	Antenna coupling to V201	705148-101KE	3
C203	Capacitor, Fixed, Ceramic Dielectric; 1000 uuf $\pm 20\%$ 500 wvdc 1/4-28 thread	B γ (150v) bypass	96509-09	6
C204	Same as C203	AGC bypass	--	--
C205	P/o XV201	V201 cathode bypass	--	--
C206	P/o XV201	V201 screen bypass	--	--
C207	Capacitor, Variable, Ceramic Dielectric; 1.5 to 12.5 uuf 500 wvdc (including no. 8-32 hex nut, no. 8-32 lock nut and lock washer)	V201 plate tuning	703721-01	2
C208	Capacitor, Fixed, Composition Dielectric; 0.5 uuf $\pm 5\%$ 500 wvdc	V201 plate coupling to V202	703907-15-05	1
C209	Same as C207	V202 grid tuning	--	--
C210	Same as C202	Coupling to V202 grid	--	--
C211	Capacitor, Fixed, Mica Dielectric; 12 uuf $\pm 10\%$ 500 wvdc	B γ (150v) bypass	705148-120KC	2
C212	Capacitor, Fixed, Composition Dielectric; 1.8 uuf $\pm 10\%$ 500 wvdc	V203 plate coupling to V202 grid	703907-28-10	1
C213	P/o XV202	V202 screen bypass	--	--

(*See Section I paragraph 4 for a complete list of assembly and model numbers versus channels, band widths, and operating voltages.)

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
C214	Same as C203	B ₁ (150v) bypass	--	--
C215	P/o XV203	V203 screen bypass	--	--
C216	Capacitor, Variable, Quartz Dielectric; 0.5 uuf to 5 uuf (including nut and washer)	V203 plate tuning	703973-01	1
C217	Capacitor, Fixed, Mica Dielectric; 24 uuf $\pm 10\%$ 500 wvdc	Coupling between grid and cathode of V203	705148-240KE	1
C218	Same as C203	B ₁ (150v) bypass	--	--
C219	Capacitor, Fixed, Mica Dielectric; 15 uuf $\pm 10\%$ 500 wvdc	V202 plate bypass	705148-150KC	1
C220	Same as C202	V202 plate coupling to V204 grid	--	--
C221	Same as C203	AGC bypass	--	--
C222	P/o XV204	V204 cathode bypass	--	--
C223	P/o XV204	V204 screen bypass	--	--
C224	Same as C211	V204 plate bypass	--	--
C225	Same as C203	B ₁ (150v) bypass	--	--
C226	Capacitor, Fixed, Mica Dielectric; 5 uuf $\pm 10\%$ 500 wvdc	V204 plate coupling to V205 grid #3	705148-050KC	1
C227	P/o XV201	Filament bypass	--	--
C228	P/o XV202	Filament bypass	--	--
C229	P/o XV202	Filament bypass	--	--
C230	P/o XV203	Filament bypass	--	--
C231	P/o XV203	Filament bypass	--	--
C232	P/o XV204	Filament bypass	--	--
C233	P/o XV204	Filament bypass	--	--
C236	Capacitor, Fixed, Mica Dielectric; 30 uuf $\pm 5\%$ 500 wvdc	V207 grid #1 bypass	705148-300JF	1
C237	Capacitor, Fixed, Ceramic Dielectric; 19/32 in. OD disc .01 uf min value 500 wvdc	B ₁ (150v) bypass	90732-07	23
C238	Same as C237	AGC bypass	--	--
C239	Same as C237	V206 cathode bypass	--	--
C240	Same as C237	V206 screen bypass	--	--
C241	Same as C237	B ₁ (250v) bypass	--	--
C242	Capacitor, Fixed, Mica Dielectric; 200 uuf $\pm 10\%$ 500 wvdc	V207 grids #2 and #4 bypass	705148-201KD	1
C243	Capacitor, Fixed, Mica Dielectric; 470 uuf $\pm 10\%$ 300 wvdc	DC blocking	705148-471KD	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
C244	Same as C237	B ₁ (250v) bypass	--	--
C245	Capacitor, Fixed, Mica Dielectric; 120 uuf $\pm 5\%$ 500 wvdc	Tunes FL201 primary	705148-121JF	2
C246	Same as C237	B ₁ (250v) bypass	--	--
C247	Same as C245	Tunes FL201 secondary	--	--
C249	Same as C237	V208 cathode bypass	--	--
C250	Same as C237	V208 screen bypass	--	--
C251	Same as C237	B ₁ (250v) bypass	--	--
C252	Capacitor, Fixed, Mica Dielectric; 100 uuf $\pm 5\%$ 500 wvdc	P/o if. filter	705148-101JD	2
C253	Same as C252	P/o if. filter	--	--
C254	Same as C237	V209 cathode bypass	--	--
C255	Capacitor, Fixed, Ceramic Dielectric; 19/32 in. OD disc 20,000 uuf min value 500 wvdc	AGC filter	90732-08	3
C256	Same as C237	V205 filament bypass	--	--
C257	Same as C237	V206 filament bypass	--	--
C258	Same as C237	V207 filament bypass	--	--
C259	Same as C237	B ₁ (150v) bypass	--	--
C260	Capacitor, Fixed, Ceramic Dielectric; 3/8 in. OD disc 1000 uuf min value 500 wvdc	Coupling between plates of C260	90732-03	1
C261	Same as C255	AF filter	--	--
C262	Capacitor, Fixed, Paper Dielectric; 10,000 uuf $\pm 5\%$ 400 wvdc	External of input coupling	96698-103-J4	4
C263	Same as C262	Coupling to V212B grid	--	--
C264	Same as C262	V212B plate coupling to volume control	--	--
C265	Capacitor, Fixed, Paper Dielectric; .37 uf $\pm 20\%$ -10%, 200 wvdc	B ₁ (250v) bypass	96547-07	1
C266	Capacitor, Fixed, Paper Dielectric; .1 uf $\pm 20\%$ 100 wvdc	V212A grid bypass	97036-104-M1	1
C267	Capacitor, Fixed, Electro- lytic; 20 uf 50 wvdc	Bypass on modulator bias	43803-13	1
C268	Capacitor, Fixed, Electro- lytic; 5 uf 50 wvdc	A ₁ filter	43803-09	1
C269	Capacitor, Fixed, Paper Dielectric; .47 uf $\pm 5\%$ 200 wvdc	V213B cathode bypass	96698-474-M1	1
C270	Capacitor, Fixed, Paper Dielectric; .047 uf $\pm 5\%$ 200 wvdc	Navigation signal coupling to V213A grid	80466-131	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
C271	Capacitor, Fixed, Electrolytic; 6 uf 400 wvdc	B _r (250v) filter	CE61C060Q	2
C272	Same as C271	B _r (350v) filter	--	--
C274	Capacitor, Fixed, Paper Dielectric; .47 uf $\pm 20\%$ 100 wvdc (including no. 5/16-24 hex nut and lock washer)	L227 interrupter bypass	97817-02	2
C275	Same as C274	L228 interrupter bypass	--	--
C276	Same as C262	AF coupling from T204 secondary to T205 primary for loudspeaker operation only	--	--
C277	Same as C237	K204 spark suppression	--	--
C278	Same as C237	K204 spark suppression	--	--
C279	Same as C237	K204 spark suppression	--	--
C280	Same as C237	K204 spark suppression	--	--
C281	Same as C237	K204 spark suppression	--	--
C282	Same as C237	K204 spark suppression	--	--
C283	Same as C237	K204 spark suppression	--	--
C284	Same as C237	K204 spark suppression	--	--
C285	Capacitor, Fixed, Mica Dielectric; 4700 uuf $\pm 5\%$ 300 wvdc	P/o AGC filter	708928-472-JD	2
C286	Same as C285	P/o AGC filter	--	--
C287	Capacitor, Fixed, Paper Dielectric; .047 uf $\pm 5\%$ 100 wvdc	P/o AGC filter	96698-473-J1	1
C288	Same as C255	AGC bypass	--	--
C289	Capacitor, Fixed, Ceramic Dielectric; 9/16 in. OD disc 5000 uuf min value 500 wvdc	Prevents arcing at high voltage brushes on dynamotor D201; P/o D201	90732-06	2
C290	Same as C289	Prevents arcing at low voltage brushes of Dynamotor D201; p/o D201	--	--
D201	Dynamotor; 13.75v 7.4 amp (including blower)	Generates B _r (14v operation only)	706889-01 (or 704915-01 reworked)	1
	Dynamotor; 27.5v 3.7 amp (including blower)	Generates B _r (28v operation only)	606889-02 (or 704915-02 reworked)	
E201	Shield, Electron Tube	Shields V201	96668-01	5
E202	Same as E201	Shields V202	--	--
E203	Same as E201	Shields V203	--	--
E204	Same as E201	Shields V204	--	--
E205	Shield, Electron Tube	Shields V205	96668-02	5
E206	Same as E205	Shields V206	--	--

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
E207	Same as E205	Shields V207	--	--
E208	Same as E205	Shields V208	--	--
E209	Same as E201	Shields V209	--	--
E210	Retainer, Electron Tube	Retains V210	703405-04	1
E211	Same as E205	Shields V211	--	--
E212	Shield, Electron Tube	Shields V212	96668-04	2
E213	Same as E212	Shields V213	--	--
E214	Board, If. Etched Circuit (p/o EX214)	Mounts if. circuit components	705321	1
E215	Board, Af Etched Circuit (p/o EX215)	Mounts af circuit components	705537	1
E216	Brush, Dynamotor, High Voltage	Brush for high voltage commutator of dynamotor D201	707998	2
E217	Same as E216	Brush for high voltage commutator of dynamotor D201	--	--
E218	Brush, Dynamotor, Low Voltage	Brush for low voltage commutator of dynamotor D201	707997	2
E219	Same as E218	Brush for low voltage commutator of dynamotor D201	--	--
EX201	Base, Electron Tube Shield	Retains tube shield E201	96481	4
EX202	Same as EX201	Retains tube shield E202	--	--
EX203	Same as EX201	Retains tube shield E203	--	--
EX204	Same as EX201	Retains tube shield E204	--	--
EX214	Receiver Subassembly, If. etched circuit (including V205, V206, V207, V208, V209, and associated components)	If. Circuit	705471	1
EX215	Receiver Subassembly, Af Etched Circuit (including V210, V211, V212, V213, and associated components)	Af circuit	705548	1
FL201	Filter, If.	If. filter and coupling between V207 and V208	705320	1
FS201	Fuse; 3AG .5 amp 125 v	B/ fuse	90781-10	1
J201	Connector, Receptacle; 1 pin, male	Antenna connector, mates w/ plug on antenna cable	U658/U	1
J202	Connector, Receptacle; 15 pin, male	Interconnection of rf circuits and other Receiver circuits; mates w/ P202	702466-01	2
J203	Same as J202	Connects S201-H and S202-C to P208	--	--
J204	Connector, Receptacle; 7 pin, male	Connects dynamotor to A/ and B/ circuits; mates w/ P204	705551-02	1
J205	Connector, Receptacle; 9 pin, male	Interconnection of front panel and other circuits; mates w/ P205	97530-B-103	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
J207	Jack, Microphone	Test connection	2636-P	--
J209	Jack, Headset	Test Connection	2630-P	--
K201	Relay, Sub-Miniature, SPDT; 14v	Connects crystals on S201-E or S201-G to coils on S201-F (14v operation only)	705126-01	1
	Relay, Sub-Miniature, SPDT; 28v	Connects crystals on S201-E or S201-G to coils on S201-F (28v operation only)	705126-02	
K202	Relay, Sub-Miniature, DPDT; 14v	Connects crystals on S202-A or S202-B to grid #1 of V205 (14 v operation only)	704989-02	2
	Relay, Sub-Miniature, DPDT; 28v	Connects crystals on S202-A or S202-B to grid #1 of V205 (28v operation only)	704989-03	
K203	Same as K202	Connects crystals Y261 or Y262 to grid #1 of V207 (used only on special models having 25 kc channel separation)	--	--
K204	Relay, 6PDT; 14v	See K204-A, -B, -C, -D, -E, or -F (14v operation only)	703489-02	1
	Relay, 6PDT, 28v	See K204-A, -B, -C, -D, -E, or -F (28v operation only)	703489-03	
K204-A	P/o K204	Receive-Transmit B/ switching	--	--
K204-B	P/o K204	Receive-Transmit B/ switching	--	--
K204-C	P/o K204	Receive-Transmit B/ switching	--	--
K204-D	P/o K204	Receive-Transmit B/ switching	--	--
K204-E	P/o K204	Connects microphone or T204 secondary to T205 primary	--	--
K204-F	P/o K204	Connects receiver volume control or sidetone volume control to V213-B grid	--	--
L201	Coil, RF	Develops antenna signal	705171	1
L202	Coil, RF (P/o S201-A)	V201 grid tuning	--	--
L203	Coil, RF, Adjustable	V201 grid tuning	705137	1
L204	Same as L202 (p/o S201-B)	V201 plate tuning	--	--
L205	Coil, RF, Adjustable	V201 plate tuning	705138	1
L206	Same as L202 (P/o S201-C)	V202 grid tuning	--	--
L207	Coil, RF, Adjustable	V202 grid tuning	706989	1
L208	Same as L202 (P/o S201-D)	V203 plate tuning	--	--
L209	Coil, RF, Adjustable	V203 plate tuning	705140	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
L210	Coil, RF	Keeps V203 cathode above RF ground	705141-04	1
L211	Coil, RF	B ₁ (105v) filter choke	96880	4
L212	Coil, RF	V203 grid tuning	705141-03	1
L214	Coil, RF, Adjustable	V202 plate tuning	705139-02	1
L215	Coil, RF, Adjustable	V204 plate tuning	705139-01	1
L216	Coil, RF	Filament choke	705141-02	2
L217	Same as L216	Filament choke	--	--
L220	Coil, RF	V205 grid #2 and 4 choke	705141-01	2
L221	Coil, RF	B ₁ (105v) filter choke	97743	1
L222	Same as L211	Filament choke	--	--
L223	Same as L211	Filament choke	--	--
L224	Same as L211	Filament choke	--	--
L225	Same as L220	V205 grid #1 tuning	--	--
L227	Relay, Rotary; 14v (including S201-H)	Causes S201-A thru -G to track setting of switches in Remote Frequency Selector (14v operation only)	703500-01	1
	Relay, Rotary, 28v (including S201-H)	Causes S201-A thru -G to track setting of switches in Remote Frequency Selector (28v operation only)	703500-02	
L228	Relay, Rotary; 14v (including S202-A, S202-B, S202-C)	Causes S202-A and S202-B to track setting of switches in Remote Frequency Selector (14v operation only)	703501-01	1
	Relay, Rotary; 28v (including S202-A, S202-B, S202-C)	Causes S202-A and S202-B to track setting of switches in Remote Frequency Selector (28v operation only)	703501-02	
L230	Coil, RF	V203 grid tuning	705141-08	4
L231	Same as L230	V203 grid tuning	--	--
L232	Same as L230	V203 grid tuning	--	--
L233	Same as L230	V203 grid tuning	--	--
O201	Retainer, Dynamotor Brush	Retains dynamotor brush E216	707993-01	4
O202	Same as O201	Retains dynamotor brush E217	--	--
O203	Same as O201	Retains dynamotor brush E218	--	--
O204	Same as O201	Retains dynamotor brush E219	--	--
O205	Clamp, Dynamotor	Retains dynamotor D201	700940-01	2
O206	Same as O205	Retains dynamotor D201	--	--
P202	Connector, Plug; 15 pin female	Interconnection of rf circuits and other Receiver circuits; mates w/ J202	702532-01	2

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
P203	Same as P202	Connects S201-H and S202-C to P208; mates w/ J203	--	--
P204	Connector, Plug; 7 pin female	Connects dynamotor to A ₁ and B ₁ circuits; mates w/ J204	705551-01	1
P205	Connector, Plug; 25 pin female	Interconnection of front panel and other circuits; mates w/ J205	97530-A-203	1
P206	Connector, Plug; 25 pin female	Connects Receiver to Remote Frequency Selector, A ₁ , B ₁ , and Transmitter; mates w/ J106	702532-02	1
P208	Connector, Receptacle; 45 pin male	Connects Transmitter-Receiver to Remote Frequency Selector, A ₁ , external audio, mike switch, loudspeaker, VOR, headset, mike, ac input, and external squelch; mates w/ J508	706279-01	1
R201	Resistor, Fixed, Composition; 6800 ohm $\pm 10\%$ 1/2w	AGC series filter impedance	57086	2
R202	Resistor, Fixed, Composition; 220 ohm $\pm 10\%$ 1/2w	V201 cathode bias	57068	3
R203	Resistor, Fixed, Composition; 47,000 ohm $\pm 10\%$ 1/2w	AGC series filter impedance	57096	3
R204	Resistor, Fixed, Composition; 470 ohm $\pm 10\%$ 1/2w	V201 screen voltage dropping	57072	11
R205	Resistor, Fixed, Composition; 10,000 ohm $\pm 10\%$ 1/2w	Prevents shorting of V202 grid signal during testing	57088	7
R206	Resistor, Fixed, Composition; 100,000 ohm $\pm 10\%$ 1/2w	V202 grid return	57100	7
R207	Same as R204	B ₁ series filter impedance	--	--
R208	Same as R206	V202 screen voltage dropping	--	--
R209	Resistor, Fixed, Composition; 2700 ohm $\pm 10\%$ 1/2w	B ₁ series filter impedance	57081	1
R210	Same as R205	V203 screen voltage dropping	--	--
R211	Resistor, Fixed, Composition; 22,000 ohm $\pm 10\%$ 1/2w	V203 grid return	57092	5
R212	Resistor, Fixed, Composition; 18,000 ohm $\pm 10\%$ 1/2w	Broadens bandpass of L214	57091	1
R213	Same as R204	B ₁ series filter impedance	--	--
R214	Resistor, Fixed, Composition; 5,600 ohm $\pm 10\%$ 1/2w	AGC series filter impedance	57085	1
R215	Same as R202	V204 cathode bias	--	--
R216	Same as R206	AGC series filter impedance	--	--
R217	Resistor, Fixed, Composition; 8200 ohm $\pm 10\%$ 1/2w	Broadens bandpass on L215	57087	2
R218	Resistor, Fixed, Composition; 100 ohm $\pm 10\%$ 1/2w	B ₁ series filter impedance	57064	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Learn Part Number	Qty Per Equipment
R219	Same as R204	B ₁ series filter impedance	--	--
R220	Same as R201	Broadens bandpass on L204 and L205	--	--
R222	Same as R211	V205 grid #3 return	--	--
R223	Same as R205	AGC series filter impedance	--	--
R224	Same as R211	V205 grid #1 return	--	--
R225	Same as R203	Prevents shorting of V205 grid signal during testing	--	--
R226	Resistor, Fixed, Composition; 180 ohm $\pm 10\%$ 1/2w	B ₁ series filter impedance	57067	4
R227	Resistor, Fixed, Composition; 68 ohm $\pm 5\%$ 1/2w	V206 cathode bias	56920	2
R228	Same as R205	AGC series filter impedance	--	--
R229	Resistor, Fixed, Composition; 820 ohm $\pm 10\%$ 1/2w	B ₁ series filter impedance	57075	1
R230	Same as R211	B ₁ series filter impedance	--	--
R231	Same as R211	V207 grid #1 return	--	--
R232	Same as R203	Prevents shorting of V207 grid signal during testing	--	--
R233	Same as R226	B ₁ series filter impedance	--	--
R235	Same as R226	B ₁ series filter impedance	--	--
R236	Same as R227	V208 cathode bias	--	--
R237	Same as R205	AGC series filter impedance	--	--
R238	Same as R226	B ₁ series filter impedance	--	--
R239	Same as R205	If. filter impedance	--	--
R240	Same as R206	Voltage divider for V211-A cathode-plate bias	--	--
R241	Same as R206	Voltage divider for V211-A cathode-plate bias	--	--
R242	Same as R205	V209 cathode bias	--	--
R243	Resistor, Fixed, Composition; 220,000 ohm $\pm 10\%$ 1/2w	V209B plate load	57104	1
R244	Resistor, Fixed, Composition; 510,000 ohm $\pm 5\%$ 1/2w	AGC series filter impedance	57013	2
R245	Resistor, Fixed, Composition; 120 ohm $\pm 10\%$ 1/2w	V209 filament shunt	57065	3
R246	Resistor, Fixed, Composition; 82,000 ohm $\pm 5\%$ 1/2w	B ₁ series filter impedance	56994	1
R247	Resistor, Fixed, Composition; 27,000 ohm $\pm 10\%$ 1/2w	B ₁ series filter impedance	57093	2
R249	Same as R245	V211 filament shunt	--	--
R250	Resistor, Fixed, Composition; 10 ohm $\pm 10\%$ 1/2w	V211A plate load	57052	3

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
R251	Resistor, Fixed, Composition; 330,000 ohm $\pm 10\%$ 1/2w	Voltage divider for V211B cathode-plate bias	57106	2
R252	Same as R251	Voltage divider for V211B cathode-plate bias	--	--
R253	Same as R245	V212A cathode bias	--	--
R256	Same as R206	V212B plate load	--	--
R257	Same as R206	B $\searrow$ series filter impedance	--	--
R258	Resistor, Fixed, Composition; 470,000 ohm $\pm 10\%$ 1/2w	Develops V212B cut-off bias during squelch operation	57108	1
R259	Resistor, Fixed, Composition; 1000 ohm $\pm 10\%$ 1/2w	V212B cathode bias	57076	1
R260	Same as R247	V212A shunt	--	--
R261	Resistor, Fixed, Composition; 600 ohm $\pm 5\%$ 1/2w	A $\searrow$ series filter impedance	704888-16	1
R262	Resistor, Fixed, Composition; 2.2 meg $\pm 10\%$ 1/2w	V212A grid bias	57116	1
R263	Same as R250	V213B grid loading	--	--
R264	Resistor, Fixed, Composition; 390 ohm $\pm 10\%$ 1/2w	V213B cathode bias	57071	1
R265	Resistor, Fixed, Composition; 2200 ohm $\pm 10\%$ 1/2w	Voltage divider for V213A cathode follower signal	57080	1
R266	Resistor, Fixed, Composition; 4700 ohm $\pm 10\%$ 1/2w	Voltage divider for V213A cathode follower signal	57084	1
R267	Resistor, Fixed, Composition; 1,000,000 ohm $\pm 10\%$ 1/2w	V213A grid return	57112	2
R268	Same as R250	VOR output impedance matching	--	--
R271	Resistor, Fixed; Wire Wound 2800 ohm $\pm 10\%$ 10w	B $\searrow$ voltage dropping	S11000-282-10	1
R272	Resistor, Fixed, Wire Wound; 5000 ohm $\pm 5\%$ 2.3w	B $\searrow$ voltage dropping	704888-28	2
R273	Resistor, Fixed, Wire Wound; 4 ohm $\pm 10\%$ 8w	Filament voltage dropping (28v operation only)	S11000-040-8	1
	Resistor, Fixed, Wire Wound; 2 ohm $\pm 10\%$ 8w	Filament voltage dropping (14v operation only)	S11000-020-8	
R274	Same as R204	K204-D spark suppression	--	--
R275	Same as R204	K204-D spark suppression	--	--
R276	Same as R272	B $\searrow$ voltage dropping	--	--
R277	Same as R202	K204-C spark suppression	--	--
R278	Same as R204	K204-C spark suppression	--	--
R279	Resistor, Fixed, Wire Wound; 850 ohm $\pm 3\%$ 25w	B $\searrow$ voltage dropping	705540	1
R280	Resistor, Fixed, Wire Wound; 80 ohm $\pm 10\%$ 8w	V107 grid bias	S11000-080-8	1
R281	Same as R204	K204-A spark suppression	--	--

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
R282	Same as R204	K204-B spark suppression	--	--
R283	Same as R204	K204-B spark suppression	--	--
R284	Same as R204	K204-A spark suppression	--	--
R285	Resistor, Fixed, Composition; 47 ohm $\pm 10\%$ 1w	L227 shunt	57326	1
R286	Resistor, Variable, Composition; 20,000 ohm $\pm 20\%$ 1/2w	Squelch control	704985-03	1
R287	Resistor, Variable, Composition; 50,000 ohm $\pm 20\%$ 1/2w	Sidetone control	704985-04	1
R288	Same as R217	Develops V212A cut-off bias	--	--
R289	Resistor, Fixed, Composition; 1,300,000 ohm $\pm 5\%$ 1/2w	P/o AGC filter	57023	1
R290	Same as R267	AGC series filter impedance	--	--
R291	Same as R244	AGC series filter impedance	--	--
S201-A	Switch Section, Rotary (including L202)	Taps coil L202	704856	3
S201-B	Switch Section, Rotary (including L204)	Taps coil L204	704855	1
S201-C	Same as S201A (including L206)	Taps coil L206	--	--
S201-D	Same as S201-A (including L208)	Taps coil L208	--	--
S201-E	Switch Section, Rotary	Selects crystals Y201 thru Y220	704859	1
S201-F	Switch Section, Rotary	Selects L230, L231, L232, or L233	704857	1
S201-G	Switch Section, Rotary	Selects crystals Y221 thru Y240	704858	1
S201-H	Switch Section, Rotary (p/o L227)	Controls L227	712825	1
S202-A	Switch Section, Rotary (p/o L228)	Selects crystals Y241 thru Y250	712826	2
S202-B	Same as S202-A (p/o L228)	Selects crystals Y251 thru Y260	--	--
S202-C	Switch Section, Rotary (p/o L228)	Controls L228	712827	1
S203	Switch, Push-Button	Releases squelch by adding R288 to V212-A cathode bias	96759-02	1
T201	Transformer, IF	If. coupling V205 to V206	710800	2
T202	Same as T201	If. coupling V206 to V207	--	--
T203	Transformer, IF	If. coupling V208 to V209	705168	1
T204	Transformer, AF	Af coupling from 213B to headset	703761	1
T205	Transformer, AF	Af coupling from mike to V107 (modulator) in Transmitter	703760	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
V201	Electron Tube; 5654	Rf amplifier	100818	4
V202	Same as V201	First mixer	--	--
V203	Same as V201	First oscillator and tripler	--	--
V204	Same as V201	First if. amplifier	--	--
V205	Electron Tube; 5750	Second mixer and second oscillator	S12000-039	2
V206	Electron tube; 6136	Second if. amplifier	700930	1
V207	Same as V205	Third mixer and third oscillator	--	--
V208	Electron Tube; 5749	Third if. amplifier	S12000-038	1
V209	Electron Tube; 5726	Detector - AGC	S12000-037	2
V210	Electron Tube; 6074	Voltage regulator	S12000-040	1
V211	Same as V209	Noise limiter	--	--
V212	Electron Tube; 5670	Squelch and first amplifier	S12000-036	2
V213	Same as V212	Navigation and second amplifier	--	--
XV201	Socket, Electron Tube (including C205, C206, C227)	Mounts V201	704990-03	3
XV202	Same as XV201 (including C213, C228, C229)	Mounts V202	--	--
XV203	Socket, Electron Tube (including C215, C230, C231)	Mounts V203	704990-02	1
XV204	Same as XV201 (including C222, C223, C232, C233)	Mounts V204	--	--
XV205	Socket, Electron Tube	Mounts V205	705545	6
XV206	Same as XV205	Mounts V206	--	--
XV207	Same as XV205	Mounts V207	--	--
XV208	Same as XV205	Mounts V208	--	--
XV209	Same as XV205	Mounts V209	--	--
XV210	Socket, Electron Tube	Mounts V210	704991	1
XV211	Same as XV205	Mounts V211	--	--
XV212	Socket, Electron Tube	Mounts V212	705544	2
XV213	Same as XV212	Mounts V213	--	--
Y201	Crystal, Quartz; 48.050 mc	108-108.95 mc crystal See table 2-5	703974-108	1
Y202	Crystal, Quartz; 48.716 mc	110-110.95 mc crystal See table 2-5	703974-110	1
Y203	Crystal, Quartz; 49.383 mc	112-112.95 mc crystal See table 2-5	703974-112	1
Y204	Crystal, Quartz; 50.050 mc	114-114.95 mc crystal See table 2-5	703974-114	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
Y205	Crystal, Quartz; 50.716 mc	116-116.95 mc crystal See table 2-5	703974-116	1
Y206	Crystal, Quartz; 51.383 mc	118-118.95 mc crystal See table 2-5	703974-118	1
Y207	Crystal, Quartz; 52.050 mc	120-120.95 mc crystal See table 2-5	703974-120	1
Y208	Crystal, Quartz; 52.716 mc	122-122.95 mc crystal See table 2-5	703974-122	1
Y209	Crystal, Quartz; 53.383 mc	124-124.95 mc crystal See table 2-5	703974-124	1
Y210	Crystal, Quartz; 54.050 mc	126-126.95 mc crystal See table 2-5	703974-126	1
Y211	Crystal, Quartz; 54.716 mc	128-128.95 mc crystal See table 2-5	703974-128	1
Y212	Crystal, Quartz; 55.383 mc	130-130.95 mc crystal See table 2-5	703974-130	1
Y213	Crystal, Quartz; 56.050 mc	132-132.95 mc crystal See table 2-5	703974-132	1
Y214	Crystal, Quartz; 56.716	134-134.95 mc crystal See table 2-5	703974-134	1
Y215	Crystal, Quartz; 57.383 mc	136-136.95 mc crystal See table 2-5	703974-136	1
Y216	Crystal, Quartz; 58.050 mc	138-138.95 mc crystal See table 2-5	703974-138	1
Y217	Crystal, Quartz; 58.716 mc	140-140.95 mc crystal See table 2-5	703974-140	1
Y218	Crystal, Quartz; 59.383 mc	142-142.95 mc crystal See table 2-5	703974-142	1
Y219	Crystal, Quartz; 60.050 mc	144-144.95 mc crystal See table 2-5	703974-144	1
Y220	Crystal, Quartz; 60.716 mc	146-146.95 mc crystal See table 2-5	703974-146	1
Y221	Crystal, Quartz; 48.383 mc	109-109.95 mc crystal See table 2-5	703974-109	1
Y222	Crystal, Quartz; 49.050 mc	111-111.95 mc crystal See table 2-5	703974-111	1
Y223	Crystal, Quartz; 49.716 mc	113-113.95 mc crystal See table 2-5	703974-113	1
Y224	Crystal, Quartz; 50.383 mc	115-115.95 mc crystal See table 2-5	703974-115	1
Y225	Crystal, Quartz; 51.050 mc	117-117.95 mc crystal See table 2-5	703974-117	1
Y226	Crystal, Quartz; 51.716 mc	119-119.95 mc crystal See table 2-5	703974-119	1
Y227	Crystal, Quartz; 52.383 mc	121-121.95 mc crystal See table 2-5	703974-121	1
Y228	Crystal, Quartz; 53.050 mc	123-123.95 mc crystal See table 2-5	703974-123	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
Y229	Crystal, Quartz; 53.716 mc	125-125.95 mc crystal See table 2-5	703974-125	1
Y230	Crystal, Quartz; 54.383 mc	127-127.95 mc crystal See table 2-5	703974-127	1
Y231	Crystal, Quartz; 55.050 mc	129-129.95 mc crystal See table 2-5	703974-129	1
Y232	Crystal, Quartz; 55.716 mc	131-131.95 mc crystal See table 2-5	703974-131	1
Y233	Crystal, Quartz; 56.383 mc	133-133.95 mc crystal See table 2-5	703974-133	1
Y234	Crystal, Quartz; 57.050 mc	135-135.95 mc crystal See table 2-5	703974-135	1
Y235	Crystal, Quartz; 57.716 mc	137-137.95 mc crystal See table 2-5	703974-137	1
Y236	Crystal, Quartz; 58.383 mc	139-139.95 mc crystal See table 2-5	703974-139	1
Y237	Crystal, Quartz; 59.050 mc	141-141.95 mc crystal See table 2-5	703974-141	1
Y238	Crystal, Quartz; 59.716 mc	143-143.95 mc crystal See table 2-5	703974-143	1
Y239	Crystal, Quartz; 60.383 mc	145-145.95 mc crystal See table 2-5	703974-145	1
Y240	Crystal, Quartz; 61.050 mc	147-147.95 mc crystal See table 2-5	703974-147	1
Y241	Crystal, Quartz; 41.950 mc	XXX.00 mc crystal See table 2-5	710798-00	1
Y242	Crystal, Quartz; 41.850 mc	XXX.10 mc crystal See table 2-5	710798-10	1
Y243	Crystal, Quartz; 41.750 mc	XXX.20 mc crystal See table 2-5	710798-20	1
Y244	Crystal, Quartz; 41.650 mc	XXX.30 mc crystal See table 2-5	710798-30	1
Y245	Crystal, Quartz; 41.550 mc	XXX.40 mc crystal See table 2-5	710798-40	1
Y246	Crystal, Quartz; 41.450 mc	XXX.50 mc crystal See table 2-5	710798-50	1
Y247	Crystal, Quartz; 41.350 mc	XXX.60 mc crystal See table 2-5	710798-60	1
Y248	Crystal, Quartz; 41.250 mc	XXX.70 mc crystal See table 2-5	710798-70	1
Y249	Crystal, Quartz; 41.150 mc	XXX.80 mc crystal See table 2-5	710798-80	1
Y250	Crystal, Quartz; 41.050 mc	XXX.90 mc crystal See table 2-5	710798-90	1
Y251	Crystal, Quartz; 41.900 mc	XXX.05 mc crystal See table 2-5	710798-05	1
Y252	Crystal, Quartz; 41.800 mc	XXX.15 mc crystal See table 2-5	710798-15	1

RECEIVER UNIT PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
Y253	Crystal, Quartz; 41.700 mc	XXX.25 mc crystal See table 2-5	710798-25	1
Y254	Crystal, Quartz; 41.600 mc	XXX.35 mc crystal See table 2-5	710798.35	1
Y255	Crystal, Quartz; 41.500 mc	XXX.45 mc crystal See table 2-5	710798.45	1
Y256	Crystal, Quartz; 41.400 mc	XXX.55 mc crystal See table 2-5	710798-55	1
Y257	Crystal, Quartz; 41.300 mc	XXX.65 mc crystal See table 2-5	710798-65	1
Y258	Crystal, Quartz; 41.200 mc	XXX.75 mc crystal See table 2-5	710798-75	1
Y259	Crystal, Quartz; 41.100 mc	XXX.85 mc crystal See table 2-5	710798-85	1
Y260	Crystal, Quartz; 41.000 mc	XXX.95 mc crystal See table 2-5	710798-95	1
Y261	Crystal, Quartz; 6.255 mc	V207 oscillator crystal for conversion of 455 kc nominal if. See table 2-5	710799-01	1
Y262	Crystal, Quartz; 6.280 mc	Crystal for derivation of 25 kc channel separation (not normally used)	710799-02	1
Z201	Receiver Subassembly, Rf and Front Panel (including V201, V202, V203, V204, and associated components)	Af circuit and test panel	705118	1

REMOTE FREQUENCY SELECTOR PARTS LIST

Series 301 to 399	Frequency Selector, Remote Models 5454A and -C, 14v, 50 and 100 kc separation respectively; Models 5454B and -D, 28v, 50 and 100 kc separation respectively. Part of LTR-800 VHF Communication and Navigation System.	Selects Transmitter and Receiver frequencies simultaneously on 800 crystal controlled channels. Contains two control knobs for frequency selection in increments of megacycles and either 100 kc or 50 kc. Also contains volume control and ON-OFF switch.	705481-01 (14v, 50 kc separation) 705481-02 (28v, 50 kc separation) 705481-03 (14v, 100 kc separation) 705481-04 (28v, 100 kc separation)	1
H301	Screw, Set Hex Socket Head; No. 6-32 by 1/8 in. lg. parkerized steel	Attaches knob O303	97519-03	5
H302	Same as H301	Attaches knob O303	--	--
H303	Same as H301	Attaches knob O304	--	--
H304	Same as H301	Attaches knob O304	--	--
H305	Same as H301	Attaches knob O305	--	--
I301	Lamp, Dial; 14v midget flange base	Dial illumination (14v operation only)	97395	2
	Lamp, Dial; 28v midget flange base	Dial illumination (28v operation only)	AN3140-327	

REMOTE FREQUENCY SELECTOR PARTS LIST (Cont)

Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
I302	Same as I301	Dial illumination	--	--
J301	Connector, Receptacle; 20 pin male	Connects Remote Frequency Selector to Transmitter-Receiver, starting relay, A/, panel light, navigational relay, omni converter relay, and Glideslope Receiver; mates w/ P401	703095-05N	1
J302	Connector, Receptacle; 20 pin male	Connects Remote Frequency Selector to Glideslope Receiver; mates w/ P402	703095-05W	1
O301	Holder, Lamp	Lamp I301 holder	701392-04	2
O302	Same as O301	Lamp I302 holder	--	--
O303	Knob	Frequency Selection (mc)	703309	1
O304	Knob	Frequency Selection (kc)	703308	1
O305	Knob	Knob for resistor-switch R301	703471	1
R301	Resistor-Switch; consists of variable composition resistor 50,000 ohm 1/4w and DPST switch 125v 3 amp (includes 3/8 - 32 mtg nut and lock washer)	ON-OFF switch and volume control	705334	1
S301-A	Switch section, Rotary	First half control wafer	710972	1
S301-B	Switch section, Rotary	Second half control wafer	710974	1
S301-C	Switch section, Rotary	Ground relay on even mc channels	703298	1
S301-D	Switch section, Rotary	Code changeover wafer	703300	1
S302-A	Switch section, Rotary	KC control wafer	710973	1
S302-B	Switch section, Rotary	Grounds relay on 50 kc channels	703479	1
S302-C	Switch section, Rotary	Controls frequency to Glideslope Receiver	705116	1
S303-A	Switch (p/o R301)	A/ ON-OFF	--	--
S303-B	Switch (p/o R301)	Dial lamp ON-OFF	--	--

SWITCH & CONNECTOR KIT PARTS LIST

Series 401-499	Kit, Switch and Connector (LTR-800) 14v or 28v	C/O connectors, relay fuses, connectors, and fuse holder used for installation of the LTR-800	708877-01 (14v) 708877-02 (28v)	1
F401	Fuse; 4 AG, 10 amp	Line fuse (28v operation only)	62685-02	3
	Fuse; 4 AG, 20 amp	Line fuse (14v operation only)	62685-01	
K401	Relay, SPST	Starting relay (28v operation only)	703665-02	1

SWITCH & CONNECTOR KIT PARTS LIST (Cont)

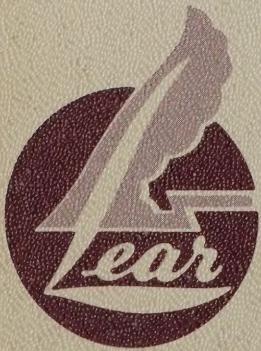
Symbol Number	Description	Function	Lear Part Number	Qty Per Equipment
	Relay, SPST	Starting relay (14v operation only)	703665-01	
P401	Connector, Plug; 20 pin female	Connects Remote Frequency Selector to Transmitter-Receiver, starting relay, A/, panel light, navigational relay, omni converter relay, and Glideslope Receiver; mates w/ J301	703097-01	1
P402	Connector, Plug; 20 pin female	Connects Remote Frequency Selector to Glideslope Receiver; mates w/ J302	703097-11W	1
XF401	Fuse holder	Mounts F401	33975	3

TRANSMITTER-RECEIVER SHOCKMOUNT PARTS LIST

Series 501-599	Shockmount LTR-800 (including parts listed below)	Mounting and system inter-connection	708882	1
A501	Shockmount	Mounts Transmitter-Receiver Unit, Filter and Connector	705011	1
FL501	Filter, Fine	Filters dynamotor noise	706497	1
J501 to J507	Not used	--	--	--
J508	Connector, Receptacle; 45 pin female	Connects Transmitter Receiver Unit to Remote Frequency Selector, A/, external audio, mike switch, loudspeaker, VOR, headset, mike, AC input, and external squelch; mates w/ P208	706279-02	1

LOW PASS FILTER PARTS LIST

Series 601 to 699	Filter Low Pass (including J601 and J602)	Attenuates Transmitter harmonics	711921	1
J601	Connector, Receptacle; 1 pin male	Connects Transmitter to low pass filter	UG58/U	2
J602	Same as J601	Connects low pass filter to co-ax switch	--	--



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